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# Measuring UK top incomes

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**Abstract**

We compare two approaches to measuring UK top income shares—the share of income going to particular subgroups, such as the top 1%. We set out four criteria that an ideal top share series should satisfy: (i) comparability between numerator and denominator; (ii) comparability over time; (iii) international comparability; and (iv) practical sustainability. Our preferred approach meets three of these; by contrast the approach currently used to produce UK fiscal income series meets none of them. Changing to our preferred approach matters quantitatively: the share of income going to the top 1% is 2 percentage points higher, but rising more slowly, than under the alternative.

JEL codes: D31, D63, E01, H2

Keywords: income inequality, measurement, national accounts, top shares

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# 1 Introduction

Top income shares – the amount of income held by some fraction of the population, say the top 1%, divided by total income in the population – provide an important insight into the unequal distribution of resources. As well as being a matter of increasing public concern in itself, the share of income captured by the top is also used by economists to understand the dynamics of entrepreneurship, innovation, growth and other macroeconomic outcomes (Gabaix et al., 2016; Jones and Kim, 2018; Aghion et al., 2019). Early work by Atkinson (2005b), later extended to produce the UK top share series in the widely-cited *World Inequality Database* (WID), illustrated how such income inequality in the UK has developed over time. Top shares declined dramatically throughout the 20th Century until the 1980s, rising again to levels seen immediately after the Second World War by the turn of the century. The measured rise in top income shares was halted by the Financial Crisis, though it appears that lately the rise in inequality has resumed.

A serious treatment of measurement issues has long been a hallmark of work on inequality and measures of top income shares (Atkinson, 2005b, 2007; Piketty and Saez, 2003, 2020; Auten and Splinter, 2019). Much of the focus has been on accurate quantification of the incomes of the richest. These are poorly measured in survey data, through a combination of lower response rates by the rich and weaker coverage of the types of income sources received by the rich (Burkhauser et al., 2018a,b; Advani et al., 2021). This has motivated the use of administrative data to replace or augment survey responses, but recent work has pointed to limitations even of administratively measured top incomes. For example, such data miss the effects of both tax evasion (Johns and Slemrod, 2010; Alstadsæter et al., 2019; DeBacker et al., 2020), and tax avoidance, where incomes are shifted into deferrable or non-taxable remuneration (Alstadsæter et al., 2016; Smith et al., 2019; Advani and Summers, 2020).

Separate to this, but equally important, is the issue of what measure of income one wants to use in principle, when thinking about measuring living standards. This issue is addressed in a parallel strand of literature (Haig, 1921; Simons, 1938; Armour et al., 2014; Larrimore et al., forthcoming a; Corlett et al., 2020). We adopt fiscal income – defined as all forms of income assessable for income tax – as our target definition. This is the longest running and most widely used measure of incomes in the UK, as well as being the starting point for other more comprehensive definitions, though it clearly excludes many welfare relevant sources of remuneration including capital gains (Advani and Summers, 2020).

While significant advances have been made in measurement of income held by the richest – the numerator in calculations of the top income share – relatively little attention has been paid to the denominator. This is largely because, in principle, it should be straightforward to measure: once we have a target definition of income, and a way to measure it among top individuals, the same approach can be extended to the rest of the population, creating an 'internal' denominator. However, top incomes are best measured in administrative tax data. These exclude very low income individuals who fall below the minimum threshold required to pay tax, known in the UK as the 'personal

allowance'. Historically, that threshold was relatively low, so the small amount of total income going to people with income below the threshold was ignored Atkinson (2005b, 2007). However, the 'personal allowance' has risen substantially, tripling over the past 20 years, so that an increasing amount of income would be missed by excluding this population. In 2016-17, 39% of adults had incomes below the personal allowance, covering 8% of total income. At the same time there have been substantial efforts to harmonise measures of inequality across countries (Atkinson, 2005a, 2007; Alvaredo et al., 2013, 2016, 2020; Garbinti et al., 2018; Piketty et al., 2018). To create international standardisation of the denominator and avoid concerns about the rising personal allowance, since 2009 the fiscal income series of WID has instead used an 'external' denominator series for the UK, based on taking components from the aggregate National Accounts (Atkinson, 2012; Alvaredo, 2017). This paper revisits the wisdom of that choice, with the benefit of hindsight and increased data availability.

We compare the merits of using an 'augmented internal' denominator – using survey data to augment the administrative tax data – to an external denominator based on National Accounts. Our augmented internal approach sums the fiscal income assessed by tax authorities, obtained from tax data, and adds to this an estimate of total income among the non-taxpaying population using survey data. Our alternative external denominator uses information from the National Accounts, retaining components of national income which have a counterpart in fiscal income.

To establish a preference for one methodological approach over another, we define a set of principles that an ideal top share series ought to satisfy, regardless of the income definition being targeted. The four criteria we set out are: (i) comparability between the numerator and denominator; (ii) comparability over time; (iii) international comparability; and (iv) practical sustainability. Judging our two fiscal income series against these criteria, we argue that while our augmented internal approach satisfies all but the third criterion, the external approach to constructing a denominator for the fiscal income series satisfies none.

Using our preferred augmented internal approach, we provide an updated series for UK top shares which will replace the current WID fiscal income series from October 2021. Our main finding is that denominator choice is quantitatively important: the share of the top 1% rises by 2pp when an augmented internal income total is used relative to an external total. Along with this higher level, our denominator implies a slightly flatter trend in top shares in recent years relative to the previous fiscal income series in WID. We find that the top 1% share of pre-tax income rose from 12.2% in 1996-97 to 15.2% in 2007-08. Top shares fell in the aftermath of the Financial Crisis, and have risen slightly in recent years, with the top 1% receiving 14.1% of pre-tax fiscal income in 2016-17.

Our approach to selecting between top income series also makes a wider methodological contribution, by providing a principled way to think about the options. The use of National Accounts to construct income control totals for estimating top shares dates back to Kuznets (1953), and has been widely adopted since (Piketty, 2003; Piketty and Saez, 2003). Work by (Atkinson, 2005b, 2007) highlighted the possibility of instead using an internal denominator, which would be more consistent with the numerator, and this approach was subsequently adopted for the UK.

Later this decision was reversed in favour of an internationally comparable denominator (Atkinson, 2012; Alvaredo, 2017), and more recently delays in producing the series have partly been driven by a need to reconcile the growing gap between the two approaches, as also highlighted by Burkhauser et al. (2018b). By setting out first some clear desiderata against which the alternatives can be compared, we are able to provide a clear rationale for which series should be preferred and why it is superior. These principles can continue to be applied as data availability evolves in the UK, as well as to decisions about denominator choice in other countries' estimates of top shares.

The top income share series and methodological justification we provide complements the recent development of Distributional National Accounts, which builds on existing fiscal income series to obtain a more comprehensive, and internationally comparable, perspective on inequality (Alvaredo et al., 2016; Piketty et al., 2018; Garbinti et al., 2018; Piketty et al., 2019). Our work will also have broader implications for the literature on UK income inequality, as many studies take external income control totals (often from WID) as given when constructing inequality statistics (Burkhauser et al., 2018b; Jenkins, 2017; Atkinson and Jenkins, 2019).

The remainder of the paper is organised as follows. Section 2 outlines the data sources. Section 3 describes the methodology used to construct our numerator. Section 4 describes the two approaches we use to construct the denominator. Section 5 sets out the four desirable criteria we believe a top share series ought to possess and outlines our reasons for preferring the series using our augmented internal denominator to one using an external denominator. Section 6 presents our updated series for top pre-tax and post-tax income shares in the UK. Section 7 concludes.

## 2 Data

Our target measure of income inequality is the share of *fiscal income* that goes to particular top shares of the population, for example the top 1%. Fiscal income is defined as income that is taxable under the personal income tax system within a country. It is the most commonly used and longest standing definition of income for measuring inequality in practice, both in the UK and internationally, because it can be accurately measured in tax data.

It is worth noting that, although readily measurable, fiscal income does not comprehensively capture all sources of income that we might think of as important for determining living standards. Notably, it misses non-taxable income from certain types of investment and state benefit. It also misses income not subject to income tax such as capital gains, even though in practice the dividing line between capital gains and labour income is often blurred (Corlett et al., 2020). There is also a wider question, when measuring inequality in society, about who should be considered: tax data only capture individuals who are resident in the UK for tax purposes, but there may be others who spend significant time in the UK and are seen as contributing to a sense of rich and poor.

Despite these limitations, there are important reasons for ensuring that fiscal income shares are measured accurately. First, it is a long-standing and well-used series (Piketty, 2003; Piketty and Saez, 2003; Atkinson, 2005b,

2007). Second, work that seeks to incorporate particular kinds of 'missing incomes' begin from fiscal income series (Alstadsæter et al., 2019; Advani and Summers, 2020). This includes recent methodological developments such as Distributional National Accounts (DINA) (Piketty et al., 2018, 2019). Finally, this is the measure of income that makes up the tax base i.e. that income tax seeks to redistribute, and so is crucial for debates about policy even where it isn't the most accurate measure of income from a welfare standpoint.

## 2.1 Survey of Personal Incomes

To construct our the numerator for all our top income share series as well as parts of the 'augmented internal' income control total (i.e. denominator), we draw on microdata captured in the Survey of Personal Incomes (SPI) Public Use Tapes, released annually by Her Majesty's Revenue and Customs (HMRC). The SPI consists of a sample of administrative tax records drawn from the universe of UK income taxpayers, covering the years 1996-97 to 2016-17. The sample consists of 482,000 individuals on average over the period. The data contain information on all income assessable for Income Tax. For individuals with incomes exceeding the tax exemption threshold (the standard PAYE personal allowance, set at £12,500 in 2020), the SPI "provides the most comprehensive and accurate official source of data on personal incomes" (HMRC, 2019). For this reason, we use the SPI as our main source of information on incomes above the personal allowance.

We include individuals with incomes above the personal allowance even if they do not pay income tax. Such individuals are captured in the SPI if their total fiscal income exceeds the personal allowance, but they have no tax liability after deductions and reliefs are taken into account. Were we to omit these individuals from our sample, their incomes would be missing altogether from the resulting income total. This represents a point of departure from the previous WID methodology which drew on tabulations of SPI data covering the *taxpaying* population. As some of the non-taxpaying population are high earners, it is possible that omitting non-taxpayers affects the WID fiscal income numerator in top income shares, as well as the denominator.

The key SPI variable used to compute the total income of those earning above the personal allowance is `total income` (TI). However, we modify this definition slightly to account for the way in which dividends are recorded in the SPI. Specifically, an adjustment is applied to the dividends component of total income to account for the notional tax credit which was available on dividends from shares in UK (and some foreign) companies until 2016-17. Until 1999, a 20% tax credit represented the tax already paid on profits made by UK companies under Advanced Corporation Tax (ACT). In 1999, ACT was abolished, but the (now notional) tax credit remained in place at a 10% rate, before being abolished altogether in 2016-17. Until 2016-17, dividends in the SPI have been grossed up by the dividend tax credit amount, though this tax credit amount does not represent any dividends actually received by individuals. To avoid creating an arbitrary discontinuity in 2016-17, we retrospectively remove the notional dividend

credit as far back as 1999-00 by reducing the SPI dividend variable by 10%.

To construct a measure of post-tax income, we deduct income tax liabilities and National Insurance contributions from our SPI pre-tax income variables. For income tax liabilities, we deduct the actual tax liability as recorded in the SPI. For National Insurance contributions, we estimate individual liabilities by applying the relevant NICs schedule in a given year to the relevant income-source variables in the SPI. This differs from the previous WID methodology, which deducted Income Tax liabilities but not National Insurance Contributions. National Insurance Contributions are functionally equivalent to a tax, and deducting them provides a more realistic measure of individual post-tax income.

## 2.2 Family Resources Survey

Tax data do not comprehensively capture individuals with incomes below the personal allowance. This presents a growing challenge to the construction of top income *shares*, which require a good estimate of the total personal income in the economy. Increases in the personal allowance over time – from £3,765 in 1996-97 to £11,000 in 2017-17 – have resulted in a decline in the proportion of the population with income above the threshold: from 68% in 2007-08 to 59% in 2016-17. Moreover, as the personal allowance has increased, so has the average income of each individual below the threshold. This means that income totals based only on the taxpaying population miss a growing proportion of total personal income. Though the SPI does capture a significant number of individuals with income below the personal allowance, HMRC note that "the SPI is not a representative data source for this part of the population" (HMRC, 2019). To capture income below the tax threshold, we supplement our tax data with information drawn from the Family Resources Survey (FRS) Public Use Files, an annual cross-sectional survey of British households containing on average 42,000 individuals per year over the sample period. In principle, the FRS is representative of the whole population. In practice, however, there is known under-coverage at the top of the income distribution (Burkhauser et al., 2018a,b; Jenkins, 2017). The SPI is a more reliable data source for top incomes, hence its use both in the current paper and as a supplement to survey data in the aforementioned literature.

Fiscal income is not directly measured in the FRS. However, the Public Use Files contain cleaned and weeklyised income receipts from different sources at an individual level, enabling us to construct a measure of fiscal income which corresponds closely to the tax code. We include all individuals with fiscal income below the standard personal allowance in our sample, regardless of whether they are likely to pay income tax or not (some individuals may pay tax if they are not entitled to the standard personal allowance). We thus use the standard personal allowance as the nominal cutoff for joining our SPI and FRS samples. In Figure A1 we show, for a plausible range of joining thresholds, that this choice makes little difference to the income control total.

When using survey data, a common concern is that totals may be biased due to under-coverage and/or under-

reporting. This is a particular issue for investment income, which is poorly captured in the FRS (Ooms, 2019; Advani et al., 2021). Since individuals with incomes below the personal allowance are likely to receive a minority of total investment income, this issue will have only a small impact on our estimates. A greater concern for our purposes is the known under-reporting of benefit income in the FRS (Corlett et al., 2018). Corlett et al. (2018) find a £37 billion gap between benefit receipts reported in the FRS and the amount reportedly paid out by the UK government. Significant gaps in taxable benefit totals, including the State Pension and Employment Support Allowance, raise the concern that we may miss a substantial proportion of benefit income – which is concentrated at the bottom of the distribution – by relying only upon the FRS. To address this issue, we obtain administrative totals for benefit expenditure from the UK government's Benefit Expenditure and Caseload Tables (Spring 2020), which are released with each budget. For benefits recorded in the SPI/FRS that can be directly compared to what is recorded in the expenditure tables, we adjust the total obtained from the SPI/FRS combined measure to match the administrative total. We discuss this further in Section 4.1.

As we are using the standard personal allowance as the joining threshold for the two datasets, we expect that the majority of the taxpaying population will be captured in the SPI sample. Individuals with incomes below the standard personal allowance, but who nevertheless pay tax (e.g. because the standard personal allowance does not apply to them) should be represented in the FRS sample of individuals with earnings below the personal allowance. We do not attempt to calculate the tax liability of these individuals when constructing our post-tax series. We do, however, deduct National Insurance contributions, estimating these in the same way as for individuals in the SPI. The threshold for National Insurance contributions has been lower than the income tax threshold in recent years and this gap is growing, meaning that a growing proportion of our FRS sample are required to make National Insurance contributions.

## 2.3 National Accounts

We construct our alternative, external income control total using data from the UK National Accounts. We use information contained in the 'Households' sector account of the most recent Blue Book publication (2019), which includes disaggregated components of household sector income as far back as 1987. The National Accounts are published on a calendar year basis. To convert our estimates to fiscal years (as the SPI, and hence our numerator, is published on this basis), we take 3/4 of the total for the earlier calendar year and 1/4 of the total for the later calendar year. This approximates the UK tax year, which runs from the 6th April to the following 5th April.

The definitions used to construct the income components in the National Accounts do not necessarily correspond to our target fiscal income definition. In Section 4.2, we discuss this in detail and show that it is a key disadvantage of the external denominator approach. A second related issue is that the National Accounts lack the detailed

disaggregation of income components necessary to adjust the income definition in line with changes in the tax code over time. Relying on the National Accounts to construct a fiscal income series comes at the cost of having to accept National Accounts income definitions – which may change over time – and the uncertainty over how well these correspond to fiscal income. Our findings below suggest that even income components as 'simple' to measure as employment income give substantially different totals in the National Accounts relative to our augmented internal measure.

### 2.4 Population

We use the same population control (i.e. total population) as used previously for the UK in the *World Inequality Database*, namely the number of adults aged 15 and over, taken from the Office for National Statistics (ONS) mid-year population estimates (Table A1). The *World Inequality Database* now favours using a 20+ population control total for most countries. However, the age bins provided in the tax data are insufficiently granular to make this possible: we cannot exclude individuals aged less than 20 from the data, instead the next bin starts at age 25. This means that, were we to use a 20+ population control to define the population size of the numerator, our top shares would likely be downward biased. We discuss this in more detail in Appendix B.1. The choice of population control is non-trivial, as our SPI/FRS sample suffers from population under-coverage, particularly in the 1990s and early 2000s. We discuss this issue further in Section 3.

## 3 Numerator

To construct the numerator of our fiscal income series, we use microdata on individual incomes from the SPI. Individuals are ranked according to their total pre/post-tax fiscal income. Aggregate income of the top X% is estimated as the total income of the top N (weighted) individuals, where N represents X% of our population control total. This differs from the approach previously used to construct WID top income shares, which applied Pareto interpolation methods to tabulations of SPI data (Atkinson, 2005b).

The magnitude of the numerator depends on the choice of population control, as our combined SPI/FRS sample suffers from population under-coverage particularly in the early years of our sample, with around 9% of individuals missing in 1997-2003. A priori, it is unclear how this impacts top share estimates. If the SPI/FRS sample captures 100% of individuals in the top X% and misses individuals located further down the income distribution, which prior research suggests could be likely (Britton et al., 2019), our top shares will be overstated when we use our 'external' population control – based on ONS figures. On the other hand, if population under-coverage occurs at the top of the distribution, then whether or not top shares are over- or under-stated depends on the shape of the income distribution. In Appendix B.2 we discuss this issue further and illustrate how top shares differ when an internal

population control – taken from the count of individuals in the grossed up data – is used instead. Importantly, the issue of population under-coverage affects top shares regardless of whether a bottom-up or top-down denominator is used. In this paper, we use the same numerator for all pre-tax top shares. Any differences in the results across series are therefore driven by the choice of denominator.

# 4 Denominator

The income control total is the denominator in a calculation of the top income share. It can be obtained in one of two ways. First, it can be derived by starting from tax microdata, and supplementing this with an estimate of total income for the non-taxpaying population—an 'augmented internal' control total. Second, it can be constructed by starting from the National Accounts, and retaining only the income components of the household sector which correspond as closely as possible to the fiscal income definition—an 'external' control total.

## 4.1 Internal Control Total: SPI

In its most basic form, the internal income control could be constructed by aggregating the total income of all individuals in the SPI, and grossing up using the SPI survey weights. However, an income total based solely on total income measured in the SPI falls short of total fiscal income for the resident population because it does not capture fiscal income that is not actually assessed by the tax authority. Relevant income that is not captured by the SPI includes fiscal income below the personal allowance, as well as fiscal income which is missed as a result of tax evasion. We augment the internal income total with an estimate of total fiscal income below the personal allowance using data from the Family Resources Survey (FRS). We use the individual-level income component variables available in the FRS to construct a fiscal income variable which corresponds to the SPI income definition. The total income of individuals whose fiscal income is below the standard personal allowance is then estimated using FRS survey weights and added to the total SPI income of those earning above the personal allowance.

This method of augmenting the internal SPI income control differs somewhat from the approach used by WID prior to 2009-10. Most importantly, the previous WID method did not systematically add in total income below the personal allowance (see Appendix C for further details). This omission made little difference to the control total at the time, as the standard personal allowance was relatively low (around £4,000 in the late 1990s). In recent years, this issue has become more pressing as the personal allowance has increased, resulting in a growing proportion of total income below the tax threshold. Our FRS adjustment is thus needed more now than it was in the past, as is reflected in Figure C1 which illustrates the growing difference this adjustment makes to our total.

While summing incomes using FRS data may capture a significant proportion of total income below the personal allowance, there is a concern that survey under-coverage and/or under-reporting may result in substantial quantities

of missing income. One example of this is the known under-reporting of benefit income in the FRS. Corlett et al. (2018) find a £37 billion gap between total benefit receipts in the FRS/HBAI and what the the government reported spending. Significant gaps exist particularly for the State Pension (£7.1 billion) and Employment Support Allowance (£6.2 billion) receipts. Missing benefit income affects the denominator of top income shares, but is unlikely to affect the numerator, as the vast majority of benefit receipts are concentrated at the bottom of the income distribution. In 2016-17, total benefit income below the personal allowance, estimated using the FRS, accounted for 88% of total benefit income using the SPI and FRS combined. The FRS component of the state pension total also represented 37% of the SPI/FRS combined total, whereas the FRS share of the income total overall was only 8%. As our procedure for supplementing the SPI control total with FRS income below the personal allowance is likely to suffer from the under-estimation of benefit income, we use administrative totals for benefit expenditure (including state pension) taken from the government's Benefit Expenditure and Caseload Tables. Specifically, we adjust the augmented internal income total by adding the difference between what the government report spending on taxable benefits, and the total amount received according to the SPI and FRS combined.

We only adjust benefit types which can be directly compared across data sources. Statutory Sick Pay and Statutory Maternity Pay, which are observable in the FRS, are not disaggregated from other income components in the SPI, meaning we cannot compare our total with the expenditure tables. Since entitlement to these benefits is concentrated among individuals with incomes above the tax threshold, under-reporting is not a major source of concern. Corlett et al. (2018) do not list SMP/SSP among the benefit types suffering from significant under-reporting across the FRS as a whole. Meanwhile, Bereavement allowance/Widowed parent's allowance/Widow's pension cannot be directly compared with 'Bereavement related benefits' in the expenditure tables, which includes a combination of taxable and non-taxable benefits. Our final benefits adjustment is therefore only applied to Carer's Allowance, ESA (of which contributory), Incapacity Benefit, Jobseeker's Allowance, and State Pension (excluding State Pension sent overseas). Overall, this adjustment increases the income total slightly (Figure C1), but by less than 1% in recent years.

While our top shares account for under-reporting of benefit income, we do not adjust for evasion. Evidence from representative audits finds that evasion as a share of reported income is higher towards the bottom of the reported income distribution, both in the UK (Advani et al., 2019; Advani, forthcoming) and US (Johns and Slemrod, 2010; DeBacker et al., 2020). Recent evidence suggests that *offshore* tax evasion specifically – the deliberate under-reporting or hiding of wealth overseas – is highly concentrated among the wealthy (Guyton et al., 2020). It is not clear how well the latter is picked up in representative audits, so the direction of the net effect on top shares is unclear.

It is not necessary that the personal allowance be used as the threshold for joining the two datasets. An alternative would be to use a fixed income threshold across all years which exceeds the personal allowance in each year. In Figure A1, we show that the choice of threshold does make a small difference to the control total: the SPI generally

finds more income above the personal allowance than does the FRS, so increasing the joining threshold results in a lower income total in most years. Our preference for using the personal allowance is based on two factors. First, in the interest of comparability between the numerator and denominator, it makes sense to use a definition of income for the denominator which is identical to the numerator for as much of the income distribution as is possible. Second, as HMRC state, "where income exceeds the [personal allowance], the SPI provides the most comprehensive and accurate official source of data on personal incomes" (HMRC, 2019).

To construct our post-tax denominator, we calculate the total post-tax (and post-NICs) income accruing to individuals with fiscal (pre-tax) income in excess of the standard personal allowance from the SPI. We add to this the total post-NICs income of individuals with pre-tax income below the standard personal allowance from the FRS. We adjust this sum to account for under-reported benefit income, using the same approach as discussed in Section 4.1. That is, we add the difference between total government expenditure on taxable benefits (including the state pension), and gross benefit income reported in our SPI and FRS subsamples, for comparable benefit types. We do not attempt to deduct tax paid on these benefit receipts in our adjustment. However, as these benefit payments are concentrated at the bottom of the income distribution, we expect the amount of tax due on this income to be insignificant relative to our income control total.

## 4.2 External Control Total: National Accounts

An alternative approach for constructing the income control is to use the National Accounts. The Blue Book tables for the household sector are published annually, and contain information on the total income of the household sector disaggregated by income component. In this section, we illustrate how one might construct an external total using the National Accounts which is as consistent as possible with fiscal income.

We draw primarily on the primary and secondary distribution of income accounts of the household sector (Tables 6.2.3 and 6.2.4S). This differs from the previous WID methodology, which used the combined 'Households and Non-Profit Institutions Serving Households (NPISH)' sectors, as these sectors were not disaggregated until 2017. Details on how our preferred National Accounts-based methodology relates to the previous WID denominator can be found in Appendix C. Primary income of the household sector consists of total income from employment (compensation of employees), self employment income (gross mixed income), imputed rent of owner-occupiers (gross operating surplus), and property income received (e.g. interest and dividends) net of interest payments. The secondary distribution of income account contains information on all social contributions and transfers paid and received by the household sector. We supplement this with information contained in the secondary distribution of income account for General Government (Table 5.2.4S), which provides a breakdown of government expenditure on social transfers by benefit type, allowing us to obtain estimates of total expenditure on taxable benefits only.

The formula used to construct our preferred external fiscal income total is as follows:

**Formula 1**

```
Wages and salaries (Table 6.2.3)
+ Gross mixed income (self-employment income) (Table 6.2.3)
+ Interest before FISIM allocation (Table 6.2.3)
+ Dividends (Table 6.2.3)
+ Withdrawals from the income of quasi-corporations (Table 6.2.3)
+ Earnings on property investment (Table 6.2.3)
+ Rent (from natural resources) (Table 6.2.3)
+ Social security pension benefits in cash (Table 6.2.4S)
+ Other social insurance pension benefits (Table 6.2.4S)
+ Incapacity benefit (Table 5.2.4S)
+ Carer's allowance (Table 5.2.4S)
+ JSA (Table 5.2.4S)
+ Widow's and Guardian's allowance (Table 5.2.4S)
+ Statutory sick pay (Table 5.2.4S)
+ Statutory maternity pay (Table 5.2.4S)
+ Unemployment benefit (Table 5.2.4S)
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The formula expressed here is 'constructive' in the sense that it sums the basic components of income which have a counterpart in fiscal income. However, the same total can be obtained by summing the aggregate components 'balance of primary incomes, gross' and 'social security benefits, other than transfers in kind', and then subtracting the unwanted components. The latter approach is the one formally taken by WID in their previous formula for constructing the fiscal income denominator (see Appendix C).

While it is possible to make some progress in aligning National Accounts income components with fiscal income, conceptual differences preclude any attempt to achieve this in full. This is a significant drawback of the National Accounts approach. For example, the National Accounts concept of income from employment makes various adjustments to employment income as measured in the SPI to account for forms of income not subject to taxation, such as rent-free dwellings and meal vouchers provided to employees. Moreover, all income components reported in the National Accounts are subject to a final adjustment during a reconciliation exercise which balances estimates of GDP obtained using the three different approaches (production, expenditure, and income). Conceptual differences between the National Accounts and SPI thus plague all categories of income, even if the income source has, in principle, a counterpart in fiscal income.

## 4.3 Comparing our denominators

Applying the methods described in the previous two sections, we find that the income total obtained via the augmented internal approach is substantially smaller than the income total obtained using the National Accounts

(Figure 1). The difference between our external total and our augmented internal total is primarily a level difference; total income is 15% (£115bn) higher on average over the period using the external measure. However, the two series follow similar time trends.

Both series diverge from the previous WID income control in recent years (Figure 1). The previous WID denominator is constructed using an SPI-based approach prior to 2009, and a National Accounts-based approach post-2009. The pre-2009 WID methodology was based on the total income of the *taxpaying* population, obtained from tabulations based on the SPI. This was supplemented with an adjustment for the pension income of non-filers, implemented by scaling up pension income to match the National Accounts total (Atkinson, 2007). The post-2009 WID methodology differs from ours in two significant ways. First, we include only the household sector from the outset, excluding the NPISH sector which had previously been combined with households in the UK National Accounts. In doing so, we avoid making ex post adjustments of the kind implemented in the previous WID series as a result of this aggregation. Second, we refine our NA-based income control formula to be as closely aligned as possibly with our target definition of income. The previous WID formula included several income components which have no counterpart in fiscal income, including a deduction for interest payments made by the household sector and many non-taxable benefits. In Appendix C, we discuss how to obtain our external income total using the previous WID definition as the point of departure.

Both our augmented internal and external income controls grow faster than the WID income control post-2009, with implications for the growth in top shares. The growth rates of our two denominator series are much more aligned with one another than with the previous WID series, which we find reassuring given the steps we take to reconcile the National Accounts with the fiscal income definition (see Appendix C).

# 5 Desireable properties in income share series

To provide a principled approach to selecting between denominator series, we first set out some key properties a 'good' top share series should fulfil. We then compare how the SPI/FRS (augmented internal) series and National Accounts (external) series compare against these metrics.

## 5.1 Comparability between numerator and denominator

For top income share measures to be meaningful, the definition of income must be consistent between the numerator and denominator. This is true regardless of which income concept is targeted. If all incomes were reported to a single authority using a consistent definition, top income shares could be constructed by simply taking the share of reported income accruing to the richest X% of those individuals. In practice, no such data exist. While administrative data collected by tax authorities arguably provide the most accurate assessment of fiscal income at the top of the

distribution, they miss income at the bottom. This is not only an issue in the UK, where individuals with earnings below the tax exemption threshold (£12,500 in 2020/21) do not generally have a tax record, but also in US studies which rely on tax return data. Other sources of data on incomes, such as household surveys, suffer from the opposite problem: poor coverage of income at the top (Burkhauser et al., 2018a,b; Atkinson et al., 2011), and top-coding (Jenkins et al., 2011). Constructing denominators for top share estimates which are representative of the whole population therefore requires combining multiple sources of data, reconciling income definitions between these data sources as far as possible. Larrimore et al. (forthcoming b) show that using administrative 'information returns' containing information on the income of non-filers closely replicates survey-based measures of non-filer income in the US. This supports the use of survey-based measures of non-filer income in the UK, where such administrative data are unavailable.

## 5.2 Comparability over time

While comparability between the numerator and denominator ensures that top income shares are meaningful at a given point in time, much of the value in estimating income inequality comes from observing what happens over time. There are challenges to interpreting dynamic trends in fiscal income shares as changes in income inequality. First, the definition of fiscal income changes naturally as the tax code evolves (Burkhauser et al., 2012, 2015; Splinter, 2018). Variation in which sources of income are included in the tax base may affect the distribution of income assessed for tax purposes, but not the distribution of income measured according to a more comprehensive definition. This issue must be borne in mind by users of top share statistics. For our purposes the goal is not to have an accurate measure of living standards, but to have an accurate measure of the fiscal income series itself, which is then the starting point from which more welfare-relevant income inequality measures can be produced.

However, this property of fiscal income – that the definition changes over time – creates the following measurement issue: data sources and methods used to construct top shares must be sufficiently flexible to definitional changes. This is particularly difficult in light of the fact that top share estimation must draw on multiple sources of data in order to be representative of the whole population.

Income tax data lends itself naturally to the measurement of top income shares according to a fiscal income definition; income measured by the tax authorities automatically follows changes in the tax code. However, any alternative sources of data used to construct the series, such as the National Accounts or survey data, must be sufficiently disaggregated into specific income components in order to construct a measure of income which is closely related to the target definition.

## 5.3 Comparability across countries

Valuable insight can be gained from comparisons of income inequality across countries and recent work has pushed the frontiers of inequality measurement with a particular focus on international comparability (Piketty et al., 2018; Alvaredo et al., 2016; Piketty et al., 2019; Garbinti et al., 2018). The goal of international comparability has driven the shift towards a National Accounts-based approach to inequality statistics. This was the primary reason for switching from an SPI-based income control to a National Accounts-based income control in the WID UK fiscal income series in 2009-10 (Atkinson, 2012).

In the context of the current exercise, an important question to ask is whether or not it is sensible to compare trends in *fiscal* income inequality at all? What is included in fiscal income varies across countries as tax codes differ. For example, the Netherlands includes the imputed rent of owner occupiers in its Income Tax base and therefore its fiscal income series (Salverda, 2013), whereas the UK does not. Changes in the tax code from one year to the next could affect the relative trends in inequality across countries even if inequality as measured using a more comprehensive income definition remains unchanged. Auten and Splinter (2019) document a dramatic change in fiscal income inequality in the US following the 1986 tax reform which broadened the tax base, and thus the sources of income reported on tax returns. In the UK, changes in dividend tax rates prompted dividend forestalling responses which are reflected in the changes in fiscal inequality observed in the aftermath of the Financial Crisis. Comparisons of such changes in inequality trends across countries must be interpreted with great care.

Fiscal income series can be made comparable across countries to the extent that the methods used to construct them abide by the same principles. However, comparability of the denominator series alone does not ensure the international comparability of the series as a whole, as both the numerator and the tax code remain highly country specific.

## 5.4 Practical considerations

Developing a top share series which works well in theory is important, but it also needs to work in practice. We identify two desireable practical criteria. First, the series should be easily maintainable into the future. This means that any sources of data used to construct the numerator and denominator must be easy to obtain, clean, and aggregate if the series is to be sustainable. National Accounts fulfil this criteria, yet do not provide the flexibility for altering income definitions as the tax code evolves. Though survey data are significantly more detailed, they are potentially more time-consuming to clean and aggregate.

Second, the series would ideally be produced and interpreted using data available at a given point in time, without requiring any updating of the past. Neither tax nor survey data, once collected and released, are subject to revisions in general. This means that a fiscal income series which draws only upon these sources of data will be fixed from

the point of estimation. In contrast, National Accounts figures are subject to frequent revisions, an outcome of the trade-off between timeliness and accuracy. In the Blue Book, the ONS warn that "expectations of accuracy and reliability in early estimates are often too high" (Office for National Statistics, 2019). A fiscal income series which draws on the National Accounts thus ought to, in the interest of accuracy, be updated as previous Blue Book figures are revised.

### 5.5 Our Preferred Denominator

We prefer the augmented internal income control total for use in constructing top shares. This approach meets three of the four criteria set out in the previous subsections.

The data series for the numerator and denominator are largely the same. The SPI provides the most accurate information on top incomes, hence there is no alternative choice for the numerator. Although the denominator does include some imputation using the FRS to capture incomes below the personal allowance, an augmented internal total clearly has the edge over an external total. Not only is using the same data source the best way of ensuring consistency in the income definition used in the denominator, the SPI also provides "the most comprehensive and accurate official source of data on personal incomes" above the personal allowance (HMRC, 2019). When supplemented with survey data which is sufficiently detailed to match tax data definitions, an augmented internal income control provides an income total for the denominator which is both highly accurate and consistent with the numerator.

An augmented internal total is also preferable from the point of view of comparability over time. The previous fiscal income series produced by WID used SPI tabulations to construct the denominator prior to the availability of microdata. The use of similar data sources over time is one requirement for comparability over time. The other is that the procedure for constructing the fiscal income series must be flexible to changes in the tax code. Again, the SPI has the advantage over National Accounts here as measurement of income in the SPI automatically evolves with the tax code. For the UK, the National Accounts are neither sufficiently disaggregated nor is the procedure for constructing them sufficiently well documented to ensure consistency with tax data definitions. Survey data on the other hand provide sufficiently detailed information on specific income components to be more flexible to definitional changes.

The move to a National Accounts-based income total in 2009-10 was primarily motivated by the international comparability of National Accounts systems (Atkinson, 2012). However, this does not ensure that the series as a whole is internationally comparable. The data source used to construct the numerator (SPI) is UK-specific, as is the tax code which defines the income measure used for the numerator. To the extent that fiscal income definitions differ across countries anyway, it is not obvious that the use of National Accounts for measuring total income offers a clear improvement.

In principle, a fiscal income series which uses an SPI-based income control is far easier to maintain than any other alternative, as the SPI is already relied upon to compute the numerator. One argument commonly put forward against using the SPI data in general is that the SPI Public Use Tapes are released with a longer time lag relative to the National Accounts, causing a delay in the availability of policy-relevant statistics. For our purposes, there is no such disadvantage as the numerator already relies on the release of SPI data. Supplementing the SPI with survey data to estimate the total income of the non-taxpaying population requires an additional time investment. However, we argue that this is a necessary burden. In the absence of this step, there is a risk that the income total obtained from the SPI will continue to diverge from the true income total as the personal allowance increases, giving rise to a top income share series which is superficially steep. Figure C1 illustrates the growing importance of this step in recent years. Adding the adjustment for missing benefit incomes using admin data imposes little extra work as these tabulations are readily available and user-friendly, though in practice this step makes only a small difference to total income. Both the FRS and government expenditure tabulations are made available well ahead of the SPI Public Use Tapes, meaning that these adjustments do not come at the expense of timeliness.

Unlike the National Accounts, which are subject to frequent revisions and adjustments, the SPI data are generally fixed from the time of publication. This means that there is no need to update previous SPI-based estimates and policy implications, whereas National Accounts-based estimates ought to be revised to reflect the latest (and most accurate) figures.

# 6 Top shares

## 6.1 Pre-tax shares

Figure 2 illustrates how the choice of denominator affects top income shares. The predominant difference is in the levels: the pre-tax income share of the top 1% is 1-2pp higher using the augmented internal control total than the external total. This means that by using an income control total which diverges from the fiscal income definition, we under-state the extent of income inequality in the UK. The choice of denominator also has a small effect the observed evolution of top income shares over time. Using an augmented internal control total, the income share of the top 1% rose in the lead up to the Financial Crisis, from 12.2% in 1996-97 to 15.2% in 2007-08, an increase of 25%. This was followed by a steep decline immediately after the Financial Crisis, though this is likely to reflect income-forestalling and income-delaying responses to the increase in the top rate of income tax (Seely, 2014; Browne and Phillips, 2017). Between 2010-11 and 2016-17, the top 1% share rose slightly from 13.5% to 14.1%. Using an external control total implies a slightly steeper rise in inequality in the late 1990s, but otherwise the two series follow similar trends.

Since 2009-10, our series diverges from the top income share series presented previously in WID (Figure 3), which

has been used as a benchmark in previous studies (e.g. Burkhauser et al., 2018b). Our results therefore affect our understanding of what has been happening to UK inequality in recent years. The WID top income shares imply that in the aftermath of the Financial Crisis, income inequality dropped below levels observed since the beginning of the 21st Century, before rising again from 2013-14 onwards. By contrast, our estimates imply that top shares dropped less severely, down to levels observed immediately prior to the Financial Crisis in 2005-07.

Top shares have risen in the past two decades, but in relative terms much more so at the very top of the income distribution. Figure 4 shows that while the share of income earned by the top 10% remained stable between 1996-97 and 2016-17, the top 1% (0.1%) share grew by 16% (32%) over the same period.

### 6.2 Post-tax shares

Our post-tax series shows the share of income at the top after income tax and National Insurance contributions are deducted from individual income. Top shares are, unsurprisingly, lower post-tax than prior to redistribution. Figure 5 shows that the top 1% (0.1%) share fell from 14.1% to 10.7% (5.6% to 4.1%) following the deduction of individual income taxes in 2016-17.

Since the 1990s, the extent of redistribution appears to have increased. Figure 6 shows the percentage reduction in top shares following the deduction of income taxes. This illustration highlights the role of tax rates in affecting redistribution: the income share of the top 1% was reduced by 17% as a result of progressive individual income taxation in 2009-10. This rose to 22% in 2010-11, coinciding with the increase in the top marginal tax rate from 40% to 50%. The reduction in top shares following the deduction of individual income taxes fell again slightly in 2013-14 when the 45% top marginal rate was introduced, from 24% to 23% for the top 1%.

## 7 Conclusion

We outline two approaches one could adopt to construct an income control total for measuring top income shares: an augmented internal control total based on tax and survey data; and an external control total based on the National Accounts. These approaches can be judged against four desirability criteria, which we define as (i) comparability between the numerator and denominator; (ii) comparability over time; (iii) comparability across countries; and (iv) practical sustainability. We argue that while the external income total serves none of these goals, the augmented internal income total serves all but the third goal of international comparability. On this basis, we advocate the use of an augmented internal income control total for constructing a fiscal income series.

Our top share series for the UK based on this augmented internal control total displays a higher level of inequality and a slightly flatter trend relative to a series based on the previous fiscal income control total (Alvaredo, 2017) published in the *World Inequality Database*. Using an updated external control total, the pre-tax fiscal income share

of the top 1% rose from 10.0% to 12.6% between 1996-97 and 2016-17. In contrast, our augmented internal series suggests the top 1% share was around 2 percentage points higher over this period, rising from 12.2% to 14.1% over the same period. This increase in income shares is even more pronounced, in relative terms, further up the income distribution.

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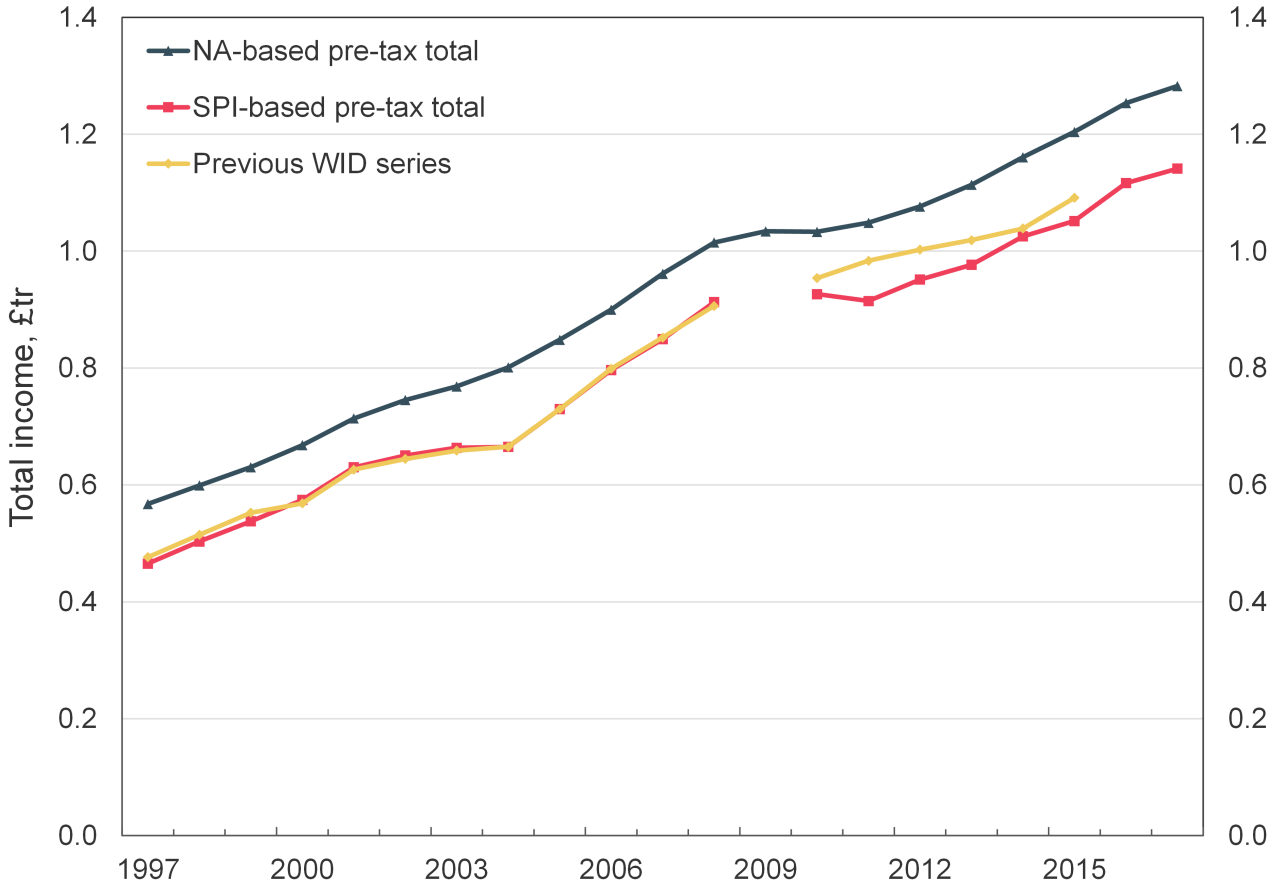
# 8 Tables and Figures

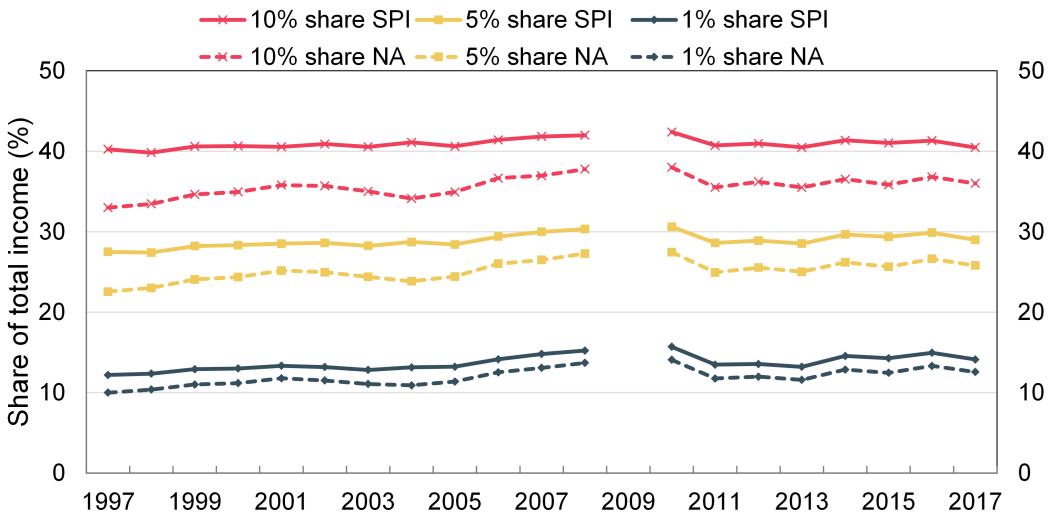
Figure 1: **Preferred SPI-based income control, National Accounts-based income control, and WID**



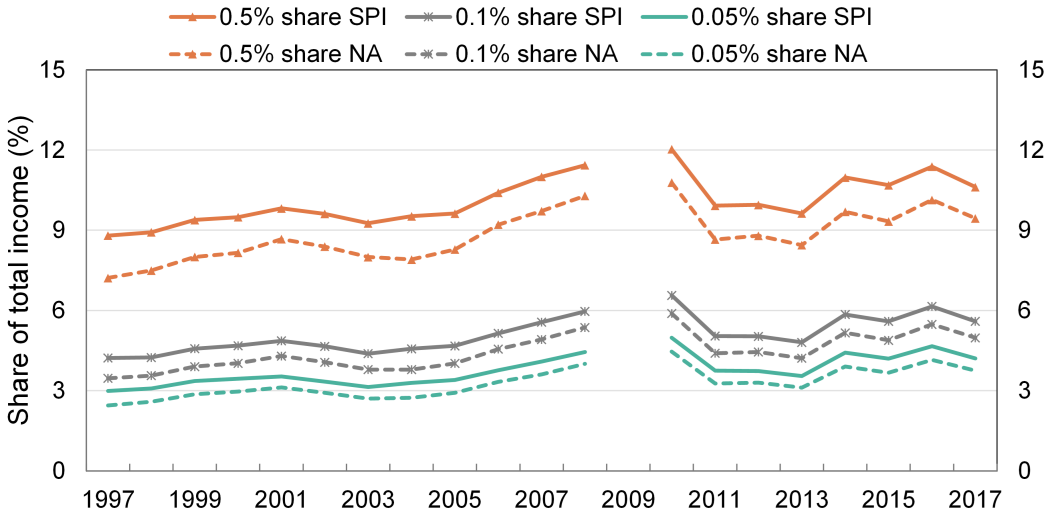

**Notes:** 'SPI-based pre-tax total' is constructed by summing individual incomes above the standard personal allowance (based on the SPI Public Use Tape); individual incomes below the standard personal allowance (based on the FRS); and an adjustment for under-reported benefit income based on administrative Benefit Expenditure and Caseload tables (as outlined in Section 4.1). 'NA-based pre-tax total' is constructed by summing income components in the 'Households' sector of the 2019 Blue Book (as outlined in Section 4.2). 'Previous WID series' is the income total published in WID prior to the release of our series.
**Source:** Authors' calculations based on the SPI, FRS, and Benefit Expenditure and Caseload tables (SPI total); the UK National Accounts (NA total); and WID (Previous WID series). Underlying data are provided in Table A3.

Figure 2: **Top shares using our SPI-based and NA-based income control totals**

(a) **Top 10%, 5%, and 1% shares**

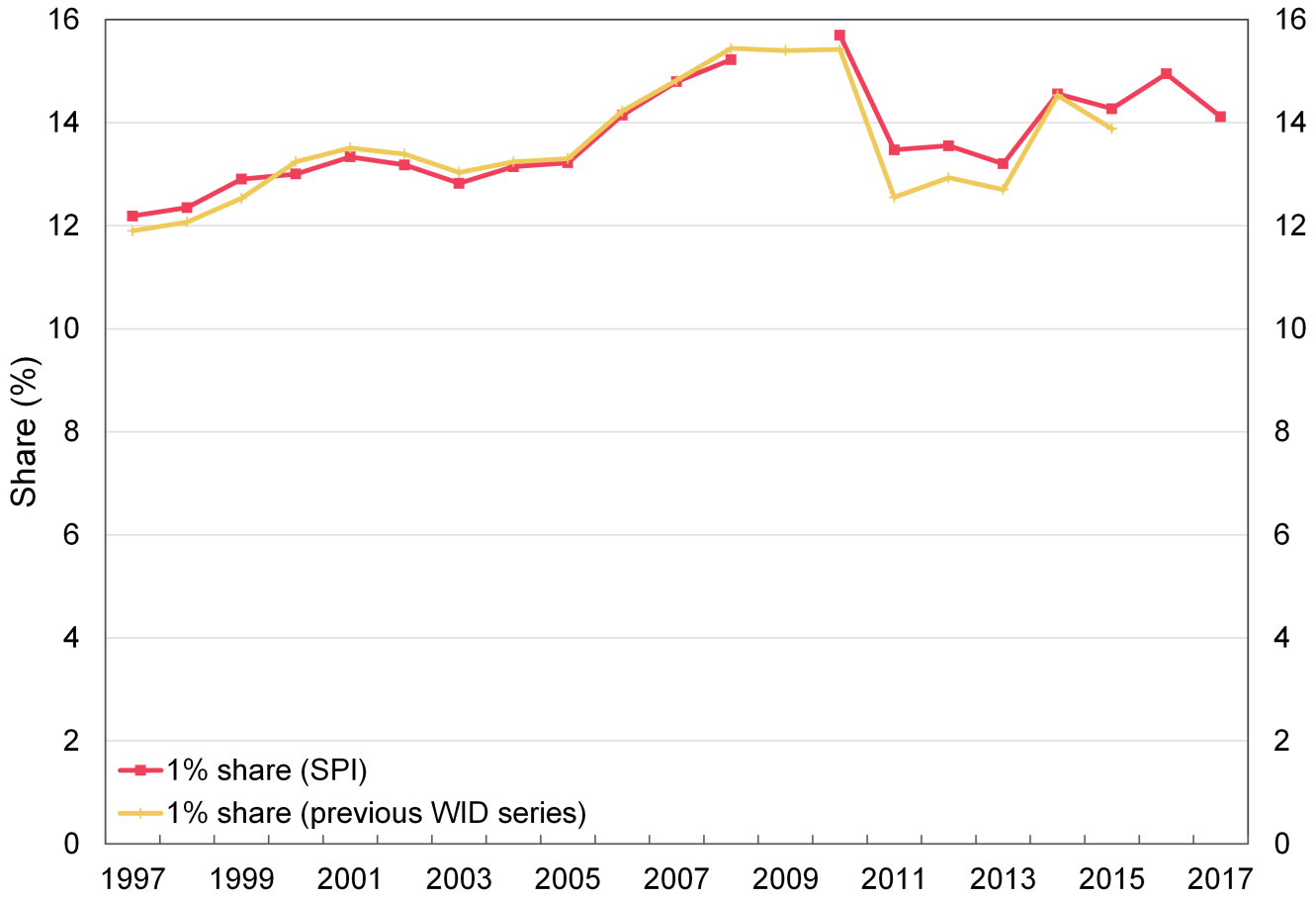



(b) **Top 0.5%, 0.1%, and 0.05% shares**



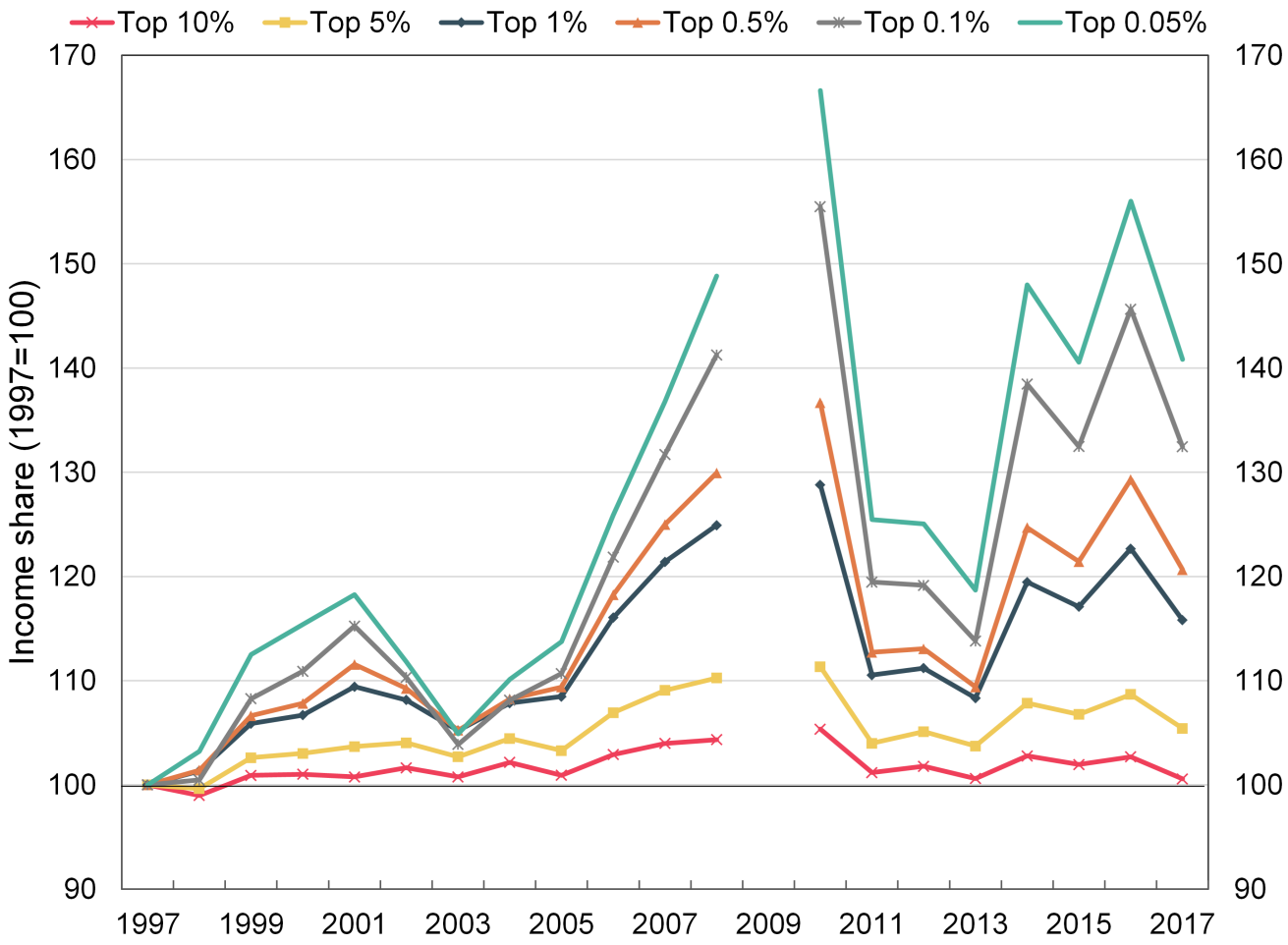

**Notes:** SPI-based top shares are constructed by dividing aggregate pre-tax income among the top X% (based on the SPI) by our preferred SPI/FRS pre-tax income total (Section 4.1). NA-based top shares are constructed by dividing aggregate pre-tax income among the top X% (based on the SPI) by our NA-based income control total (Section 4.2). All top shares are defined relative to the total number of individuals aged 15 or older in the population living in the UK.
**Source:** Authors' calculations based on the SPI, FRS and Benefit Expenditure and Caseload Tables (SPI-based shares); and the UK National Accounts (NA-based shares).

Figure 3: **Top 1% share: ours and the previous WID series**




**Notes:** SPI-based top shares are constructed by dividing aggregate pre-tax income among the top X% (based on the SPI) by our preferred SPI/FRS pre-tax income total (Section 4.1). All top shares are defined relative to the total number of individuals aged 15 or older in the population living in the UK. 'Previous WID series' is the fiscal income series published in WID prior to the relase of our series.
**Source:** Authors' calculations based on the SPI, FRS and Benefit Expenditure and Caseload Tables (SPI-based shares); and WID ('Previous WID series').

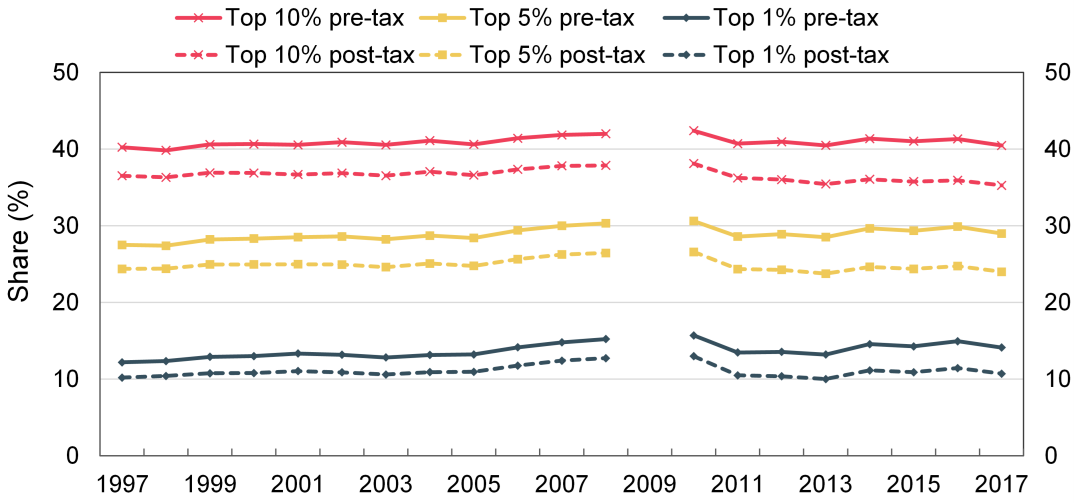
Figure 4: **Growth in top shares relative to 1997**



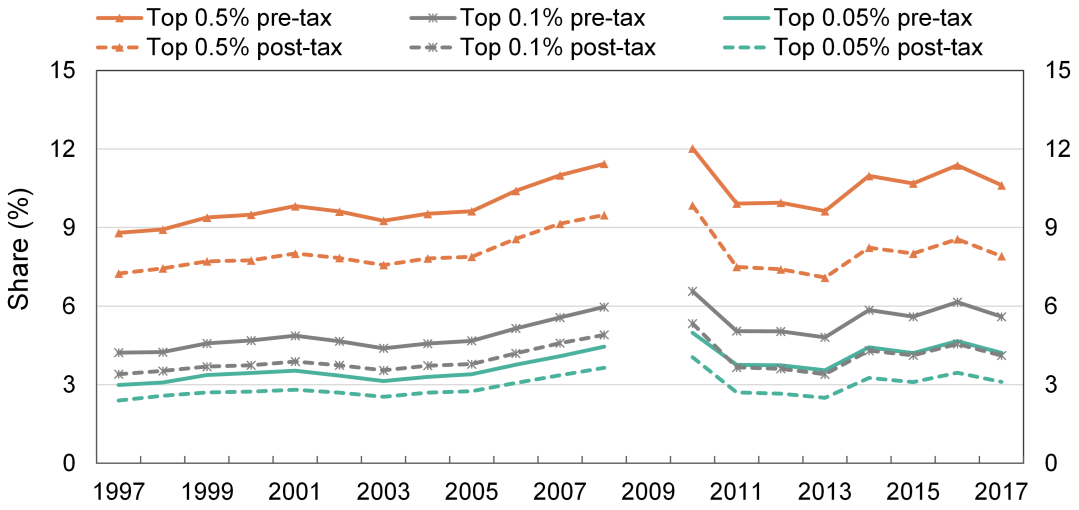

**Notes:** SPI-based top shares are constructed by dividing aggregate pre-tax income among the top X% (based on the SPI) by our preferred SPI/FRS pre-tax income total (Section 4.1). The series are normalised such that the top share in 1996-97 is equal to 100. All top shares are defined relative to the total number of individuals aged 15 or older in the population living in the UK.
**Source:** Authors' calculations based on the SPI, FRS and Benefit Expenditure and Caseload Tables.

Figure 5: **Top pre- and post-tax income shares**

(a) **Top 10%, 5%, and 1% shares**

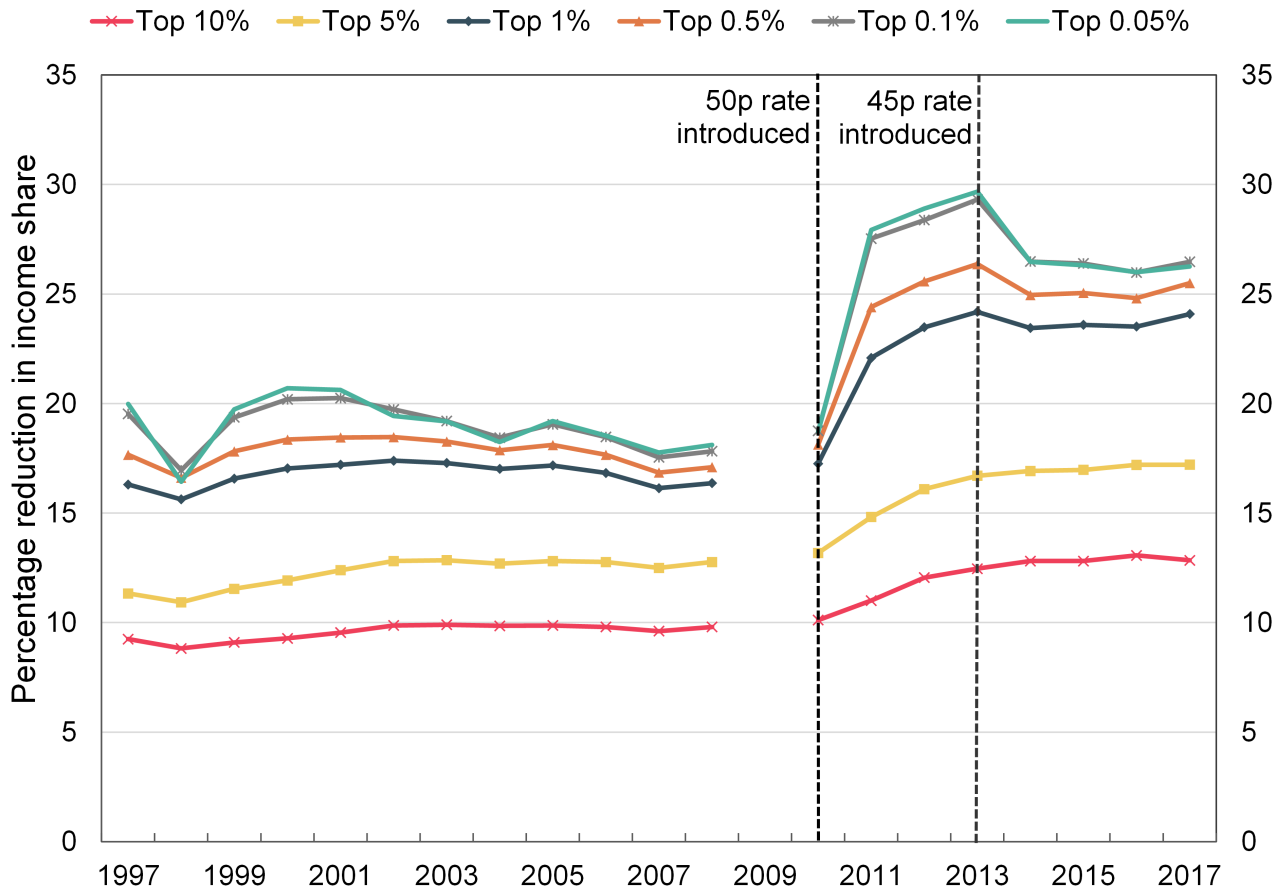



(b) **Top 0.5%, 0.1%, and 0.05% shares**




**Notes:** Pre-tax shares are constructed by dividing the aggregate pre-tax income of the top X% (based on the SPI) by our preferred SPI-based income control total. Post-tax shares are constructed by deducting individual Income Tax liabilities and National Insurance contributions from pre-tax individual income. Individuals are re-ranked on post-tax income to construct the post-tax numerator. For Income Tax liabilities, we deduct the actual tax liability as recorded in the SPI. For National Insurance contributions, we calculate individual estimates by applying the relevant NICs schedule in a given year to the relevant income-source variables in the SPI and FRS.
**Source:** Authors' calculations based on the SPI, FRS, and Benefit Expenditure and Caseload Tables.

Figure 6: **Percentage reduction in top shares following redistribution**




**Notes:** Constructed by calculating the percentage difference between the post-tax share of the top X% and the pre-tax share of the top X%. Shares are based on our SPI-based numerator and SPI-based denominator. All top shares are defined relative to the total number of individuals aged 15 or older in the population living in the UK.
**Source:** Authors' calculations based on the SPI, FRS, and Benefit Expenditure and Caseload Tables.

# Appendices

## A Additional Tables and Figures

Table A1: **Population control totals (millions)**

| Tax year | UK 15+ population mid-year estimate |
|---|---|
| 1996-97 | 46,802,000 |
| 1997-98 | 46,919,000 |
| 1998-99 | 47,071,000 |
| 1999-00 | 47,347,000 |
| 2000-01 | 47,652,000 |
| 2001-02 | 48,007,000 |
| 2002-03 | 48,306,000 |
| 2003-04 | 48,625,000 |
| 2004-05 | 48,980,000 |
| 2005-06 | 49,436,000 |
| 2006-07 | 49,850,000 |
| 2007-08 | 50,266,000 |
| 2008-09 | 50,648,000 |
| 2009-10 | 50,996,000 |
| 2010-11 | 51,781,000 |
| 2011-12 | 52,169,000 |
| 2012-13 | 52,491,000 |
| 2013-14 | 52,798,000 |
| 2014-15 | 53,189,000 |
| 2015-16 | 53,579,000 |
| 2016-17 | 53,971,000 |

**Notes:** UK 15+ population taken from the ONS UK 15+ population mid-year estimate.
**Source:** Office for National Statistics.

Table A2: **Income components included in our NA-based total and WID's NA-based total**

| Income component | WID (ESA95) | WID (ESA10) | Our NA-based total |
|---|---|---|---|
| Wages and salaries (excluding employers' contributions) | ✓ | ✓ | ✓ |
| Gross operating surplus (inc. imputed rent of owner-occupiers) | ✓ | ✓ | |
| Gross mixed income (self-employment income) | ✓ | ✓ | ✓ |
| Social security pension benefits in cash | ✓ | ✓ | ✓ |
| Widows' and guardians' allowances | ✓ | ✓ | ✓ |
| Unemployment benefit | ✓ | ✓ | ✓ |
| Jobseeker's allowance (contributory) | ✓ | ✓ | ✓ |
| Incapacity benefit (includes ESA) | ✓ | ✓ | ✓ |
| Maternity benefit | ✓ | ✓ | |
| Statutory sick/maternity pay | ✓ | ✓ | ✓ |
| Other social insurance pension benefits (including occupational pensions) | ✓ | ✓ | ✓ |
| Other social insurance non-pension benefits not provided by General Government (including employer-provided non-pension insurance) | ✓ | ✓ | |
| War pensions and allowances | ✓ | ✓ | |
| Income support | ✓ | ✓ | |
| Income tax credits and reliefs | ✓ | ✓ | |
| Child benefit | ✓ | ✓ | |
| Non-contributory JSA | ✓ | ✓ | |
| Care allowances | ✓ | ✓ | ✓ |
| Disability benefits | ✓ | ✓ | |
| Universal credit | ✓ | ✓ | |
| Personal Independence Payments | ✓ | ✓ | |
| Other benefits | ✓ | ✓ | |
| Interest received before FISIM (actual interest paid by banks) | ✓ | ✓ | ✓ |
| FISIM allocation received (National Accounts concept: implicit 'service charge' paid by households to financial intermediaries) | ✓ | ✓ | |
| Distributed income of corporations (dividends, withdrawals from the income of quasi-corporations, earnings on property investment) | ✓ | ✓ | ✓ |
| Income attributable to insurance policy holders | | | |
| Income payable on pension entitlements | | ✓ | |
| Investment income attributable to collective investment fund shareholders (dividends, retained earnings) | | | |
| Rent (on natural resources) | ✓ | ✓ | ✓ |
| *Deductions* | | | |
| Housing benefits (component of "social benefits other than transfers in kind") | ✓ | ✓ | |
| Imputed rent (of Household, NPISH, and General Government sectors) | ✓ | ✓ | |
| Interest (inc. FISIM) paid by households | ✓ | ✓ | |
| Rent paid by households (on natural resources) | ✓ | ✓ | |
| Fixed capital consumption | ✓ | ✓ | |
| Final 10% deduction | | ✓ | |

**Notes:** The formula for 'WID (ESA95)' is based on Atkinson (2012). The formula for 'WID (ESA10)' is based on Atkinson and Ooms (2015). Social fund benefits are added rather than subtracted in 'WID (ESA10)' as Atkinson and Ooms (2015) suggest. The formula for 'Our NA-based total' is our own derived measure of fiscal income using the Blue Book.
**Source:** Atkinson (2012); Atkinson and Ooms (2015); Office for National Statistics (2019).

Table A3: **Income control totals (millions)**

| **Tax year** | NA-based pre-tax | SPI-based pre-tax | SPI-based post-tax | Previous WID series |
|---|---|---|---|---|
| 1996-97 | 567,464 | 465,331 | 366,511 | 476,479 |
| 1997-98 | 599,142 | 503,211 | 399,127 | 514,729 |
| 1998-99 | 630,392 | 537,770 | 423,937 | 552,598 |
| 1999-00 | 668,018 | 574,891 | 455,509 | 568,467 |
| 2000-01 | 713,800 | 630,583 | 496,654 | 626,305 |
| 2001-02 | 745,270 | 650,808 | 514,745 | 644,550 |
| 2002-03 | 768,489 | 663,663 | 525,216 | 658,785 |
| 2003-04 | 801,155 | 665,044 | 521,058 | 665,214 |
| 2004-05 | 848,346 | 729,668 | 570,417 | 729,666 |
| 2005-06 | 900,018 | 796,702 | 619,382 | 798,792 |
| 2006-07 | 961,284 | 849,304 | 658,683 | 852,000 |
| 2007-08 | 1,014,762 | 912,836 | 706,542 | 906,262 |
| 2008-09 | 1,033,949 | | | |
| 2009-10 | 1,033,108 | 926,323 | 727,573 | 953,933 |
| 2010-11 | 1,048,554 | 914,663 | 717,278 | 983,554 |
| 2011-12 | 1,076,348 | 951,385 | 748,247 | 1,002,550 |
| 2012-13 | 1,113,348 | 976,471 | 772,251 | 1,018,712 |
| 2013-14 | 1,160,730 | 1,025,186 | 812,751 | 1,038,730 |
| 2014-15 | 1,203,970 | 1,051,531 | 836,068 | 1,091,202 |
| 2015-16 | 1,253,224 | 1,116,354 | 887,112 | |
| 2016-17 | 1,282,528 | 1,141,179 | 913,683 | |

**Notes:** 'NA-based pre-tax' is constructed by summing income components in the 'Households' sector of the 2019 Blue Book (as outlined in Section 4.2). 'SPI-based pre-tax' is constructed by summing individual incomes above the standard personal allowance (based on the SPI Public Use Tape); individual incomes below the standard personal allowance (based on the FRS); and an adjustment for under-reported benefit income based on administrative Benefit Expenditure and Caseload tables (as outline in Section 4.1). 'SPI-based post-tax is constructed as 'SPI-based pre-tax' after deducting income tax and National Insurance contributions. 'Previous WID series' is the income total published in WID prior to the release of our series.
**Source:** Authors' calculations based on the SPI, FRS, and Benefit Expenditure and Caseload tables (SPI total); the UK National Accounts (NA total); and WID (Previous WID series).

Table A4: **Top shares pre-tax (%), SPI-based series**

| | Top 10% | Top 5% | Top 1% | Top 0.5% | Top 0.1% | Top 0.05% |
|---|---|---|---|---|---|---|
| 1996-97 | 40.24% | 27.49% | 12.19% | 8.80% | 4.22% | 2.99% |
| 1997-98 | 39.83% | 27.40% | 12.35% | 8.92% | 4.24% | 3.09% |
| 1998-99 | 40.60% | 28.21% | 12.90% | 9.38% | 4.57% | 3.36% |
| 1999-00 | 40.65% | 28.33% | 13.00% | 9.49% | 4.68% | 3.45% |
| 2000-01 | 40.54% | 28.51% | 13.33% | 9.82% | 4.87% | 3.54% |
| 2001-02 | 40.90% | 28.61% | 13.18% | 9.61% | 4.66% | 3.34% |
| 2002-03 | 40.54% | 28.23% | 12.82% | 9.26% | 4.39% | 3.14% |
| 2003-04 | 41.11% | 28.72% | 13.14% | 9.52% | 4.57% | 3.29% |
| 2004-05 | 40.61% | 28.40% | 13.22% | 9.63% | 4.68% | 3.40% |
| 2005-06 | 41.41% | 29.40% | 14.14% | 10.40% | 5.15% | 3.76% |
| 2006-07 | 41.84% | 29.99% | 14.79% | 11.00% | 5.56% | 4.09% |
| 2007-08 | 41.99% | 30.32% | 15.22% | 11.43% | 5.97% | 4.45% |
| 2008-09 | | | | | | |
| 2009-10 | 42.39% | 30.61% | 15.70% | 12.03% | 6.57% | 4.98% |
| 2010-11 | 40.71% | 28.59% | 13.47% | 9.92% | 5.05% | 3.75% |
| 2011-12 | 40.96% | 28.90% | 13.55% | 9.95% | 5.03% | 3.74% |
| 2012-13 | 40.48% | 28.52% | 13.20% | 9.63% | 4.81% | 3.55% |
| 2013-14 | 41.35% | 29.65% | 14.56% | 10.97% | 5.85% | 4.42% |
| 2014-15 | 41.02% | 29.35% | 14.27% | 10.68% | 5.60% | 4.20% |
| 2015-16 | 41.32% | 29.88% | 14.95% | 11.38% | 6.15% | 4.66% |
| 2016-17 | 40.47% | 28.99% | 14.11% | 10.62% | 5.59% | 4.21% |

**Notes:** Constructed by dividing aggregate pre-tax income among the top X% (based on the SPI) by our preferred SPI/FRS pre-tax income total (Section 4.1). Top shares are defined relative to the total number of individuals aged 15 or older in the population living in the UK.

**Source:** UK series: authors' calculations based on the SPI, FRS and Benefit Expenditure and Caseload Tables (SPI-based shares).

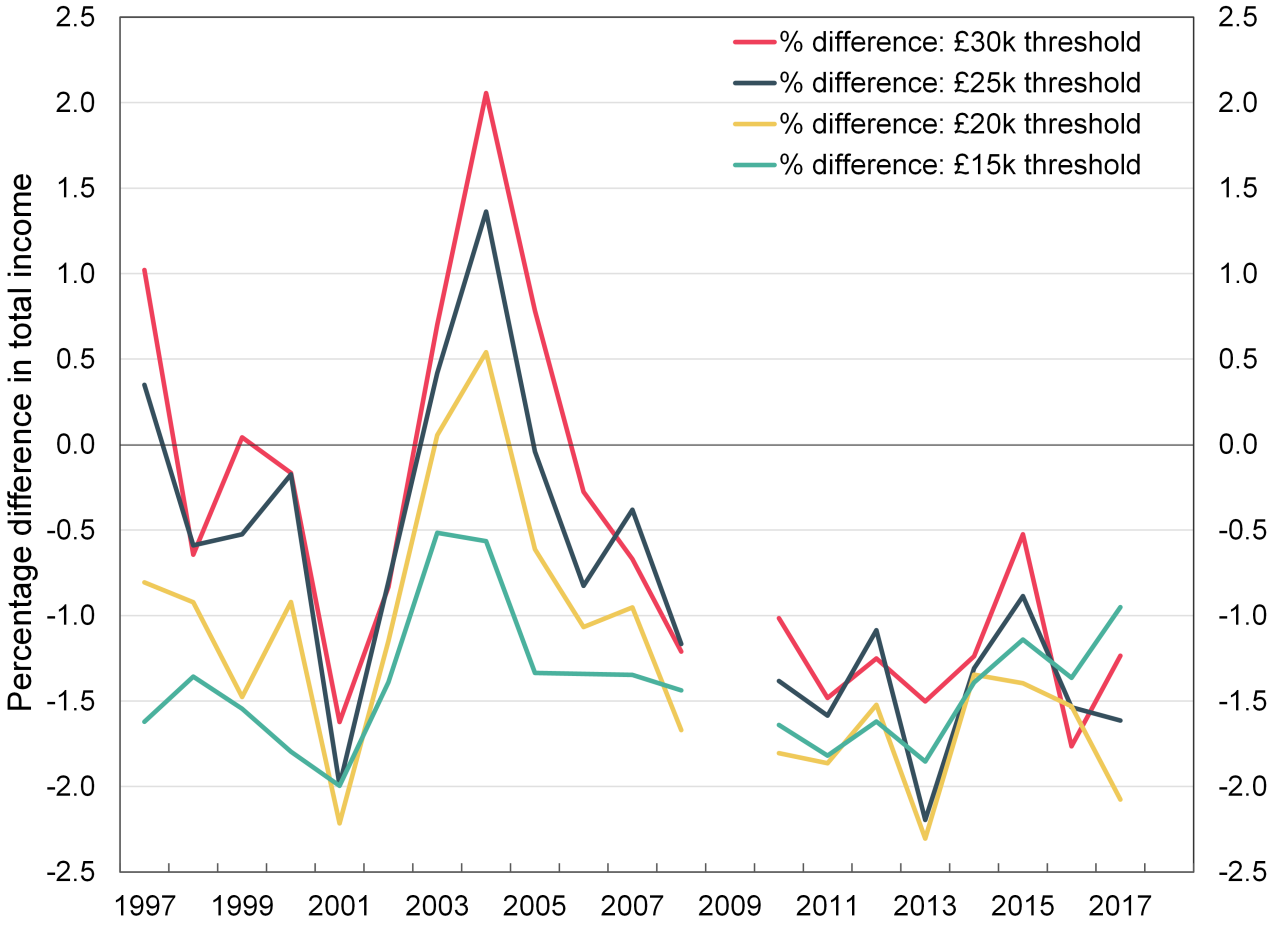
Table A5: **Top shares post-tax (%), SPI-based series**

| | Top 10% | Top 5% | Top 1% | Top 0.5% | Top 0.1% | Top 0.05% |
|---|---|---|---|---|---|---|
| 1996-97 | 36.52% | 24.38% | 10.20% | 7.25% | 3.40% | 2.39% |
| 1997-98 | 36.32% | 24.40% | 10.42% | 7.44% | 3.52% | 2.58% |
| 1998-99 | 36.91% | 24.96% | 10.77% | 7.71% | 3.69% | 2.70% |
| 1999-00 | 36.90% | 24.98% | 10.81% | 7.77% | 3.75% | 2.75% |
| 2000-01 | 36.68% | 24.98% | 11.05% | 8.01% | 3.89% | 2.81% |
| 2001-02 | 36.88% | 24.96% | 10.90% | 7.85% | 3.75% | 2.70% |
| 2002-03 | 36.53% | 24.61% | 10.61% | 7.57% | 3.55% | 2.54% |
| 2003-04 | 37.06% | 25.07% | 10.91% | 7.82% | 3.72% | 2.69% |
| 2004-05 | 36.60% | 24.76% | 10.95% | 7.88% | 3.78% | 2.75% |
| 2005-06 | 37.35% | 25.65% | 11.76% | 8.57% | 4.20% | 3.07% |
| 2006-07 | 37.82% | 26.24% | 12.41% | 9.15% | 4.59% | 3.36% |
| 2007-08 | 37.87% | 26.45% | 12.73% | 9.48% | 4.90% | 3.64% |
| 2008-09 | | | | | | |
| 2009-10 | 38.10% | 26.58% | 12.99% | 9.85% | 5.34% | 4.05% |
| 2010-11 | 36.23% | 24.35% | 10.50% | 7.50% | 3.66% | 2.70% |
| 2011-12 | 36.02% | 24.25% | 10.37% | 7.40% | 3.60% | 2.66% |
| 2012-13 | 35.44% | 23.76% | 10.01% | 7.09% | 3.40% | 2.50% |
| 2013-14 | 36.06% | 24.64% | 11.14% | 8.23% | 4.30% | 3.25% |
| 2014-15 | 35.77% | 24.37% | 10.90% | 8.01% | 4.12% | 3.10% |
| 2015-16 | 35.92% | 24.74% | 11.43% | 8.56% | 4.55% | 3.45% |
| 2016-17 | 35.27% | 24.00% | 10.71% | 7.91% | 4.11% | 3.10% |

**Notes:** Constructed by dividing aggregate post-tax income among the top X% (based on the SPI) by our preferred SPI/FRS post-tax income total (Section 4.1). Top shares are defined relative to the total number of individuals aged 15 or older in the population living in the UK.

**Source:** UK series: authors' calculations based on the SPI, FRS and Benefit Expenditure and Caseload Tables (SPI-based shares).

Figure A1: **Percentage difference in SPI-based income total using different joining thresholds (relative to personal allowance)**




**Notes:** Each income control total is constructed by summing individual incomes above £Y in the SPI; individual incomes below £Y in the FRS; and an adjustment for under-reported benefit income based on administrative Benefit Expenditure and Caseload tables (as outline in Section 4.1).
**Source:** Authors' calculations based on the SPI, FRS, and Benefit Expenditure and Caseload Tables (SPI total).

# B Population Control

## B.1 20+ Population Control

Whereas the previous UK fiscal income series included adults aged 15+ in the population control total, the *World Inequality Database* now favours a population control which only includes adults aged 20+. We do not present a series here using this control total. The reason for this is that while we can use external estimates of the total number of adults aged 20+ to set the number of individuals included in our numerator, the SPI public use tape does not record age precisely enough for us to identify and exclude younger individuals.

Using a 20+ population control total to determine the size of the numerator population necessarily means including fewer individuals than when a 15+ population control is used, reducing the magnitude of the numerator. Failing to exclude younger individuals from the data has two implications. First, it is possible that some 15-19 year olds have sufficient income to place them in the top 1%, say, using a 20+ population control to define the size of the numerator. This means that the observed numerator will upward biased, as those who ought to replace these high-earning 15-19 year olds in the numerator have a lower income by construction. Second, the income of these younger individuals will be included in the denominator, meaning that the denominator is also upward biased (unless all 15-19 year olds have zero income). In theory, the direction of bias were we to create a series using this method is therefore unclear. In practice, the income distribution of individuals aged 16-19 in the FRS (who we can observe) suggests these individuals are concentrated at the bottom of the income distribution: no one in this age category has an income exceeding £30,000. This suggests that, were we to produce a series using a 20+ population control without excluding younger individuals from the sample, our top shares would almost certainly be downward biased.

## B.2 Internal Population Control

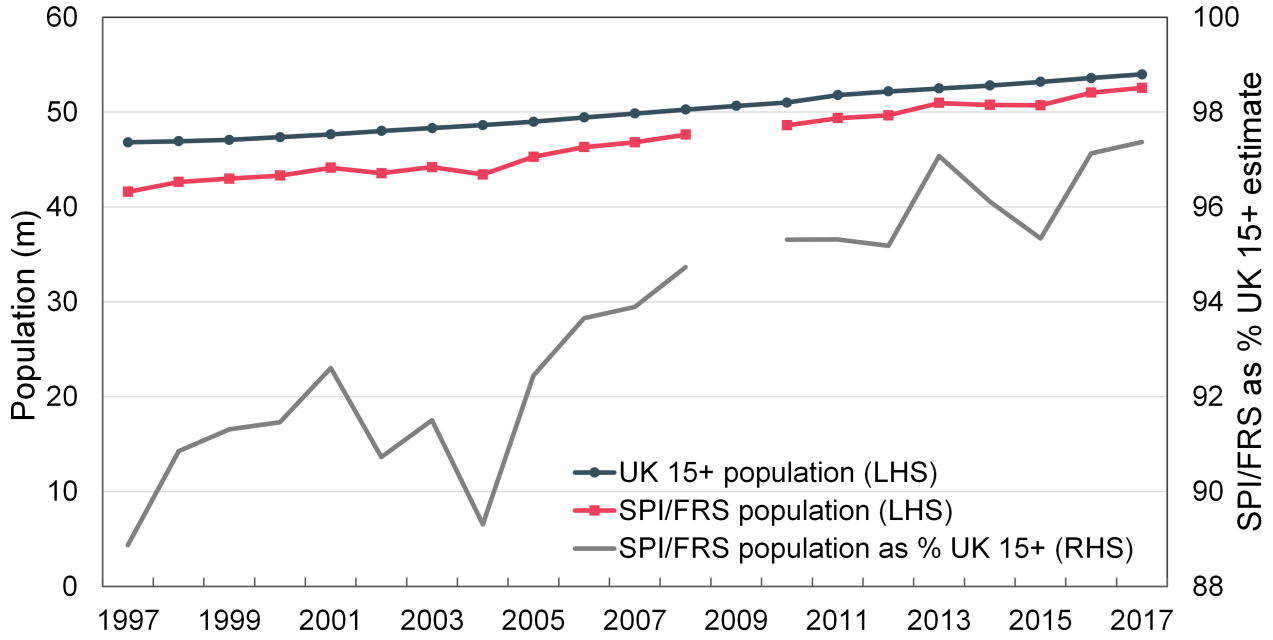
In recent years, population coverage in our combined SPI/FRS sample has improved, and the population total now corresponds to 97% of the ONS mid-year estimate. In the 1990s and early 2000s, population coverage fell far short of the ONS total at 89-93%. With incomplete population coverage, the choice of which population control to use matters for top share estimates. In this section we illustrate how and why population coverage varies over the time period, discuss the cases under which different population controls may provide more accurate top share estimates, and show how top shares vary when an internal population control is used.

Which population control yields the most accurate estimate of top income shares depends on how population under-coverage is distributed across the income distribution. The ONS population control will be provide an accurate estimate of top income shares in the extreme case that all population under-coverage is concentrated among individuals with zero fiscal income. In this case, the income control is correct despite the population under-coverage

(we only miss people who have no income), and we observe the incomes of all individuals who actually represent the top X% of the population. On the other hand, the internal population control will provide an accurate estimate of top income shares if under-coverage is uniformly distributed across the income distribution. In other cases, it is often impossible to say which population control provides the most accurate estimate. If we have full coverage of the top X% of the population, and under-coverage is concentrated lower down the distribution among those with positive income, then using the ONS population control will overstate top income shares (the numerator will be accurate while the denominator will be too low), but using an internal population control does not guarantee greater accuracy in this case (depending on the distributions of income and under-coverage, using an internal population control may understate top shares). On the other hand, if we have incomplete coverage of the top X% of the population, then both population controls will yield biased estimates and the direction of bias is ambiguous. Which population control is most reasonable therefore depends, to some extent, on how population coverage is likely to be distributed across the income distribution.

Since 2007, population coverage in our combined sample has been at least 95% (Figure B1). Prior to this, population coverage was lower, at only 89% in 1997. There are a number of potential explanations for this under-coverage. One is under-coverage of individuals below the personal allowance stemming from some individuals being outside the scope of the FRS. Those living in institutional settings (care homes, students in halls of residence, prisoners) are estimated to total 1.2m (Corlett et al., 2018), and are not represented in the FRS. The adult population in the FRS also excludes 15-year-olds (of whom there were 714,000 in 2019-20). However, where individuals outside of the scope of the FRS are liable to pay income tax (e.g. on pensions for those in care homes), they will be captured by the SPI. This means that under-coverage of these groups should only be an issue at the bottom of the income distribution. This will not affect the accuracy of the ONS population control in capturing the top X% of the income distribution, and will have only a minor effect on the income control total.

Figure B1: **SPI/FRS combined population and ONS UK 15+ total**



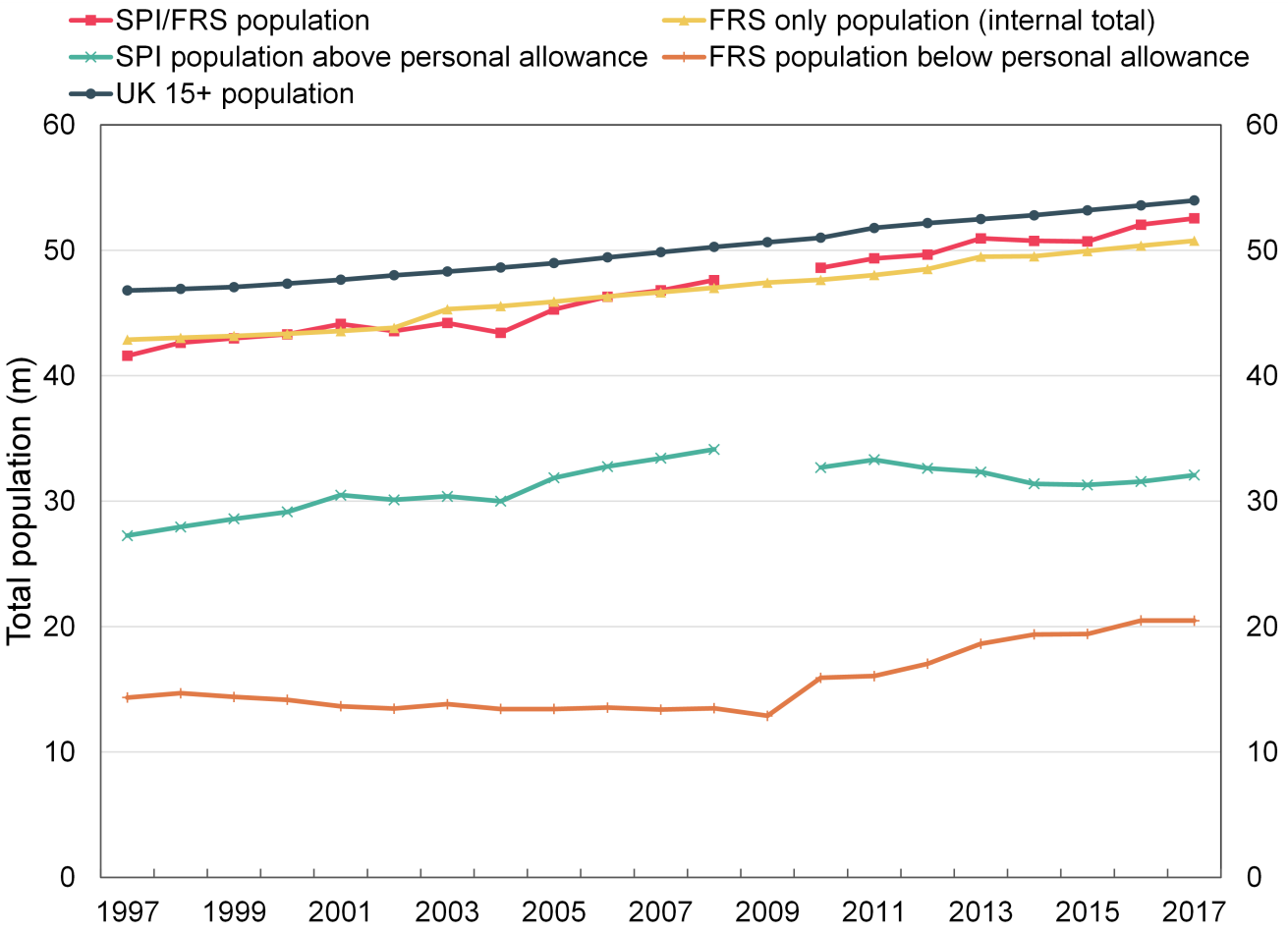

**Notes:** 'SPI/FRS population' sums the total population of individuals with fiscal income above the standard personal allowance in the SPI, and the total population of individuals with fiscal income below the standard personal allowance in the FRS.
**Source:** Authors' calculations based on the SPI and FRS. The 'UK 15+ population mid-year estimate' is obtained from the ONS.

However, it appears that population under-coverage in the earlier years can be at least partly attributed to the coverage of taxpayers within the SPI. Figure B2 shows that the population coverage of the FRS has remained stable over time, with the exception of a small increase in 2003 when Northern Ireland joined the sample population (the number of individuals in Northern Ireland with incomes below the personal allowance was just 494,000 in 2003). The total number of individuals with earnings above the personal allowance in the SPI was flat in the mid 2000s, despite a growing UK population. Moreover, within most £5k income ranges between £10,000 and £65,000, the SPI identifies fewer people than the FRS does between 2002-03 and 2004-05, with population coverage increasing thereafter. Most of this rise can be attributed to a rise in the coverage of taxpayers, rather than a rise in the coverage of individuals included in the SPI who ultimately pay no income tax. Why the coverage of taxpayers in the SPI increases in the early 2000s remains something of a mystery.

It is not clear what the implications of these findings are for our top share estimates. If the under-coverage issue mainly concerns those on lower or middle incomes, our top shares will be over-estimated. On the other hand, if the rise in population coverage mainly reflects an increase in the coverage of top earners, it is not possible to sign the bias of our estimates. In either of these cases, it is not clear that using an internal population control can provide a more accurate estimate—and this problem is not changed by alternative choice of denominator, which is an independent

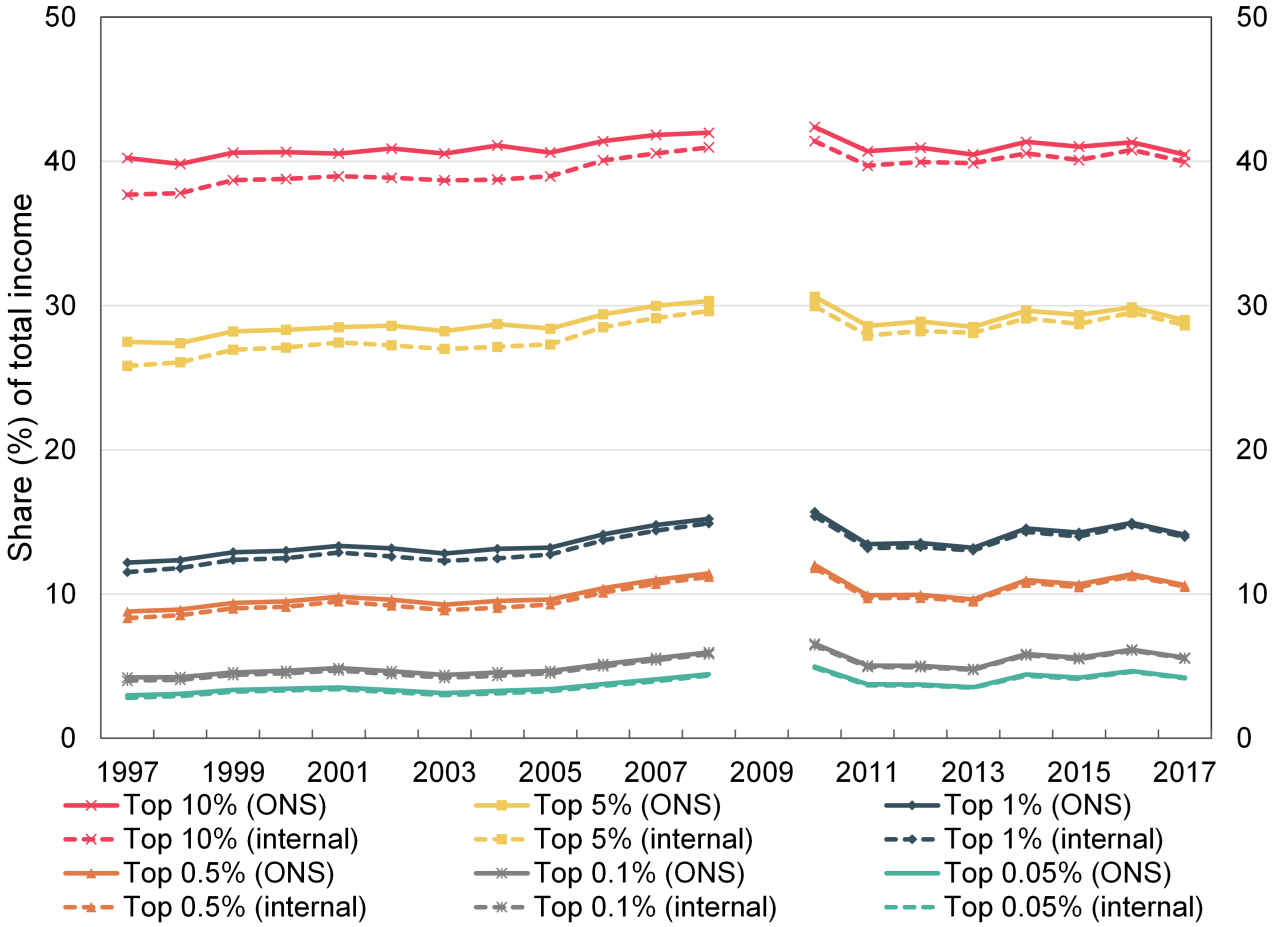
issue. However, we present our top share series using an internal population control (taking X% of the SPI/FRS combined population total) in Figure B3 for comparison. Using the internal population control, top shares rose during the 1990s and 2000s relative to top shares using the ONS population control. As population coverage rose, so too did the number of people included in the top X%, generating a mechanical increase in the aggregate income of the top X% which offsets the increase in the control total. Since 2008, the choice of population control makes little difference to top income shares as coverage is high.

Figure B2: **Population totals by source**




**Notes:** 'Total SPI/FRS population' sums the total population of individuals with fiscal income above the standard personal allowance in the SPI, and the total population of individuals with fiscal income below the standard personal allowance in the FRS. 'FRS only population' is the total (weighted) population of all individuals covered in the FRS. 'FRS population below personal allowance' is the total (weighted) population of all individuals in the FRS with fiscal income below the personal allowance. 'SPI population above personal allowance' is the total (weighted) population of all individuals in the SPI with fiscal income above the personal allowance. The latter two series sum to obtain the 'Total SPI/FRS population'.
**Source:** Authors' calculations based on the SPI and FRS. The 'UK 15+ population mid-year estimate' is obtained from the ONS.

Figure B3: **SPI-based top shares using alternative population control totals**




**Notes:** Top shares labeled 'ONS' are constructed using the ONS UK 15+ mid-year population estimate as the population control total. Top shares labeled 'internal' are constructed using the internal SPI/FRS population total as the population control.

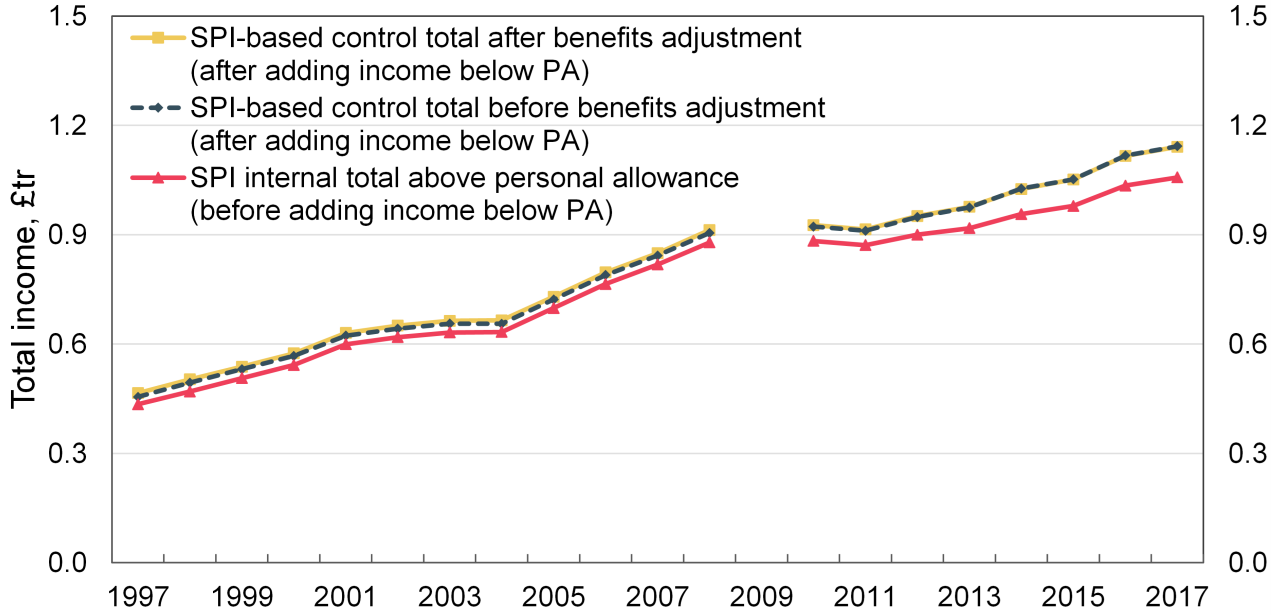
**Source:** Authors' calculations based on the SPI, FRS and Benefit Expenditure and Caseload Tables (SPI-based shares).

# C Comparison with WID Fiscal Income Series

Prior to 2009, the income control total used by WID for the UK fiscal income series was based on the income of the taxpaying population as recorded in the SPI. This was taken from Personal Income Statistics tabulations, which are based on the SPI, rather than from the microdata. A key difference is that the tabulations omit non-taxpayers with incomes above the standard personal allowance (whose tax liability is reduced to zero after deductions and reliefs). We include these individuals in our SPI total, adding 1 million individuals in 2016-17 and increasing aggregate income above the personal allowance by 1% (£14 billion). The SPI total in WID was supplemented with pension income captured in the National Accounts which was over and above the pension income total obtained from the SPI (Atkinson, 2007). No explicit adjustment was made to account for (non-pension) income below the personal allowance, which made little difference at the time as the personal allowance was so low. As Figure C1 suggests, this omission made little difference to the income total in the years for which this method was used, but in recent years, omitting incomes below the personal allowance results in a growing amount of missing income from the control total, making the need for our FRS adjustment all the more pressing.

Supplementing the internal SPI income total with data from the FRS has the disadvantage of making the production of top income share statistics slightly more tedious. However, we argue that Figure C1 provides a compelling reason for making this effort. In the most recent year, excluding the FRS adjustment would lead us to underestimate total income by 7.5%, up from 5% in 2010 and 6.6% in 1997. Fortunately, total income below the personal allowance can be estimated straightforwardly, using FRS variables which have already been cleaned and expressed a weeklyised format. FRS data is released ahead of the SPI Public Use Tape, so supplementing the SPI total in this way does not come at the expense of timeliness.

Figure C1: **SPI-based income control totals before and after adjustments**




**Notes:** 'SPI internal total above personal allowance (before adding incomes below the PA)' is constructed by summing the total income (TI) of all individuals with incomes in excess of the standard personal allowance in the SPI. 'SPI-based control total before benefits adjustment (after adding income below PA)' is constructed by adding the total income of individuals with incomes below the standard personal allowance from the FRS to the SPI internal total. 'SPI-based control total after benefits adjustment (and after adding income below PA)' is constructed by adding an adjustment for under-reported benefit income equal to the difference between total income in the SPI/FRS combined total and the amount reported in the UK government's Benefit Expenditure and Caseload tables.
**Source:** Authors' calculations based on the SPI, FRS, and Benefit Expenditure and Caseload Tables.

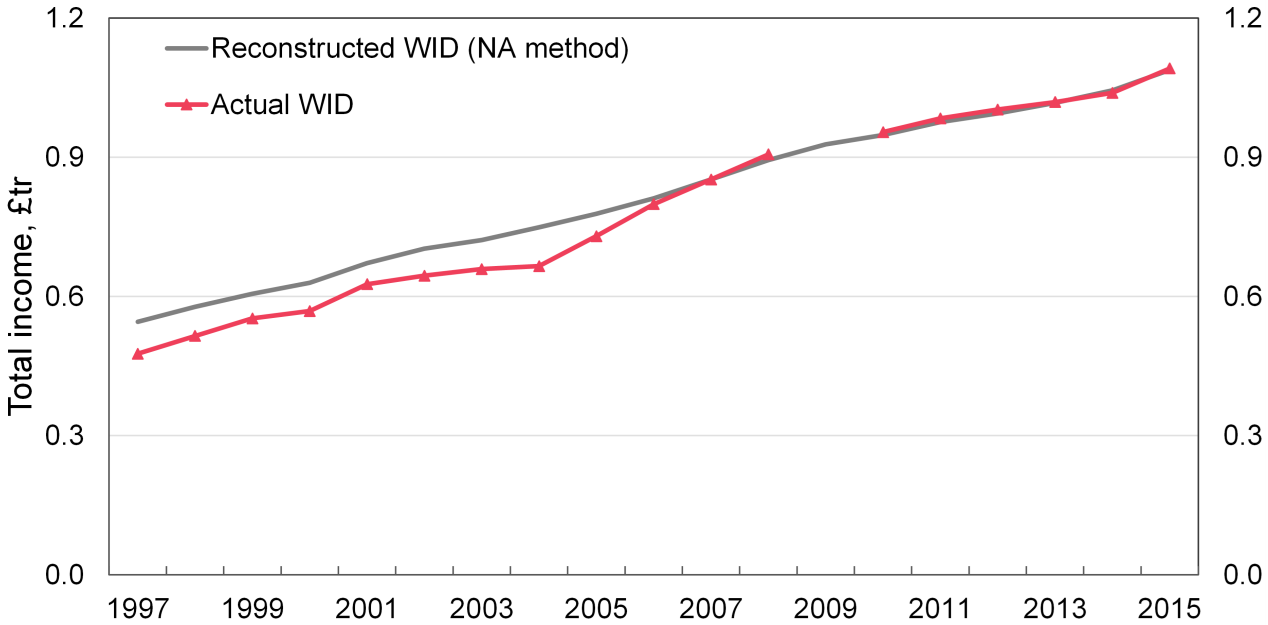
From 2009, the decision was taken to transition to a National Accounts-based approach for the denominator of the fiscal income series, on the basis that this would offer improved comparability across countries (Atkinson, 2012). At the time, the two methods yielded almost identical income control totals for 2007-08, and this year was thus seen as "a good year in which to make the change" (Atkinson, 2012). Figure C2 illustrates the point at which the two series appear to cross. Originally, the WID income total was based on the pre-2014 system of accounts (ESA95) and was constructed as follows[1]:

```
   Balance of primary income, gross
+ social benefits, other than transfers in kind
- social fund benefits[2]
- redundancy fund benefits
- employers' actual social contributions
- imputed rent of owner-occupiers
- attributed property income of insurance policy holders
- imputed social contributions (net)
- housing benefits
```

[1]This formula is expressed as in the WID technical reports. In Table A2 the WID formulae are expressed "constructively" to illustrate the sub-components which are retained in the final income control total using this method.
[2]This is actually subtracted, rather than added as the recent WID technical notes suggest (Atkinson and Ooms, 2015)

- fixed capital consumption

Figure C2: **WID income control and reconstructed WID NA-based income control**




**Notes:** 'Reconstructed WID (NA)' is constructed using the most recent WID formula (Alvaredo, 2017) with data from the 'Households and NPISH' sector of the 2016 Blue Book. Note that the income totals differ from the actual WID statistics for 2010-2014 as we use the 2016 Blue Book to obtain figures for all previous years, rather than using the earliest Blue Book available for a given year. 'Actual WID' is the income control published in WID prior to the release of our update series.
**Source:** 'Reconstructed WID (NA)': authors' calculations based on the UK National Accounts. 'Actual WID': WID.

The balance of primary income of the Household and NPISH sectors consists of total income from employment (compensation of employees), self employment income (gross mixed income), imputed rent of owner-occupiers (gross operating surplus), and property income received (e.g. interest and dividends) net of payments.

In 2014, a new system for constructing the National Accounts (ESA2010) came into force, prompting changes in the how the income control was constructed. The formula was modified to include "investment income payable on pension entitlements" (payable into pension funds, rather than directly to households) in the income total (Atkinson and Ooms, 2015). This income had previously been deducted under the aggregated component "attributed property income of insurance policy holders", and was reintroduced on the grounds that this investment income is ultimately received by households (Atkinson and Ooms, 2015). The revised income total, using the new definition and updated Blue Book figures, was 10.1% higher in 2009-10, 9.9% higher in 2010-11, and 9.0% higher in 2011-12. The inclusion of "investment income payable on pension entitlements", which in 2012 was estimated at £70 billion (around 7-8% of the control total) explains a significant proportion of this increase. However, ONS publications which accompanied the revised 2014 Blue Book suggested that there were also revisions to the estimated income of the NPISH sector, which until recently was combined with the household sector in the National Accounts (ONS, 2014; ONS, 2014).

Atkinson and Ooms (2015) also note that the upward revision would "call into question the previous choice of 2009 as a link year with the previous method", and the decision was taken to reduce the ESA2010-based totals by 9.6% on a provisional basis. The percentage by which the total has been reduced has subsequently increased as more recent Blue Book figures have implied a larger difference between the revised totals and the earlier totals in the years following the WID switch (Alvaredo, 2017).

Since 2014, the formula used by WID to construct the National Accounts-based income total is as follows:

```
   Balance of primary incomes, gross
+ social benefits, other than transfers in kind
- social fund benefits[3]
- redundancy fund benefits
- employers' actual social contributions
- imputed rent of owner-occupiers
- attributed property income of insurance policy holders
- attributed property income to collective investment fund shareholders
- imputed social contributions (net)
- housing benefits
- fixed capital consumption
Final total is reduced by approximately 10%
```

There are two key issues with the WID approach which we seek to address. The first is that the current estimates are based on National Accounts in which the household and NPISH sectors are combined. Ideally, we would exclude the income of the NPISH sector from our measure of total fiscal income, an issue noted in Atkinson and Ooms (2015). Since 2017, these sectors have been disaggregated in the National Accounts, and we are now able to construct the income total using only the household sector from the outset. This being the case, we see no justification for reducing the income total by 10% as done previously. When we exclude the NPISH sector, the income total obtained is less than 1% higher than the total obtained using the WID formula, prior to the 10% deduction (see Section C.1). This has two implications. The first is that the 10% reduction deducts income which is actually attributable to the household sector, suggesting that the WID method may underestimate total household income. The second is that including the NPISH sector has an insignificant effect on the income total. This is consistent with Blue Book figures which suggest that the NPISH sector alone accounts for less than 1% of gross national income each year. Total income for the NPISH sector only, using the same definition as for the household sector, ranges from £1 billion in 1999 to £3.5 billion in 2017, less than 1% of total income for the household sector.

Our second major departure from the WID methodology addresses the issue of definitional differences. The WID formula diverges from fiscal income in a number of its components. As noted by Atkinson and Ooms (2015), the WID formula deducts interest paid by the household sector (on mortgages etc.), and makes a deduction for measured

[3]This is actually subtracted, rather than added as the recent WID technical notes suggest (Atkinson and Ooms, 2015)

depreciation (fixed capital consumption). No such deductions are made in fiscal income. The WID formula also includes the majority of non-taxable benefits, as well as investment income payable on pension entitlements (which is received by pension funds rather than households directly). Neither have a counterpart in fiscal income. As one of our stated goals of a good fiscal income series is that the denominator should be as consistent as possible with the numerator, we take steps to modify the National Accounts-based approach to this end.

Table A2 illustrates the income components which are retained in (i) the original WID formula (based on ESA95); (ii) the most recent WID formula (based on ESA10); and (iii) our formula as outlined in Section 4.2. It is clear that the WID formulae are much more comprehensive in terms of the sources of income included, but that these formulae also involve a number of deductions which have no counterpart in fiscal income. The most significant in magnitude are the deductions for interest paid by households (which includes mortgage payments), fixed capital consumption, and imputed rent.

Unlike in the WID definition, we do not include gross operating surplus accrued by the household sector (a component of the balance of gross primary income). The majority of this component is accounted for by the imputed rent of owner-occupiers, but actual rental income (from the leasing of dwellings) may also be included here. The imputed rent of owner occupiers has no place in fiscal income, and in the WID definition a deduction is made to account for this. The issue with this approach is that the amount deducted for imputed rent comes from the consumption expenditure tables of the Household, NPISH, and General Government sectors combined, and this total exceeds the gross operating surplus of the household (and NPISH) sector. This results in an (economically meaningless) net deduction from total income. While there is an argument for including a small fraction of the household sector gross operating surplus in the income total to approximate actual rental income (which has a counterpart in fiscal income), this approximation is likely to be highly inaccurate. In Section C.6 we illustrate the (small) effect of including a constant fraction of gross operating surplus in our income total. For our main NA-based fiscal income series, we choose to exclude gross operating surplus from the outset.

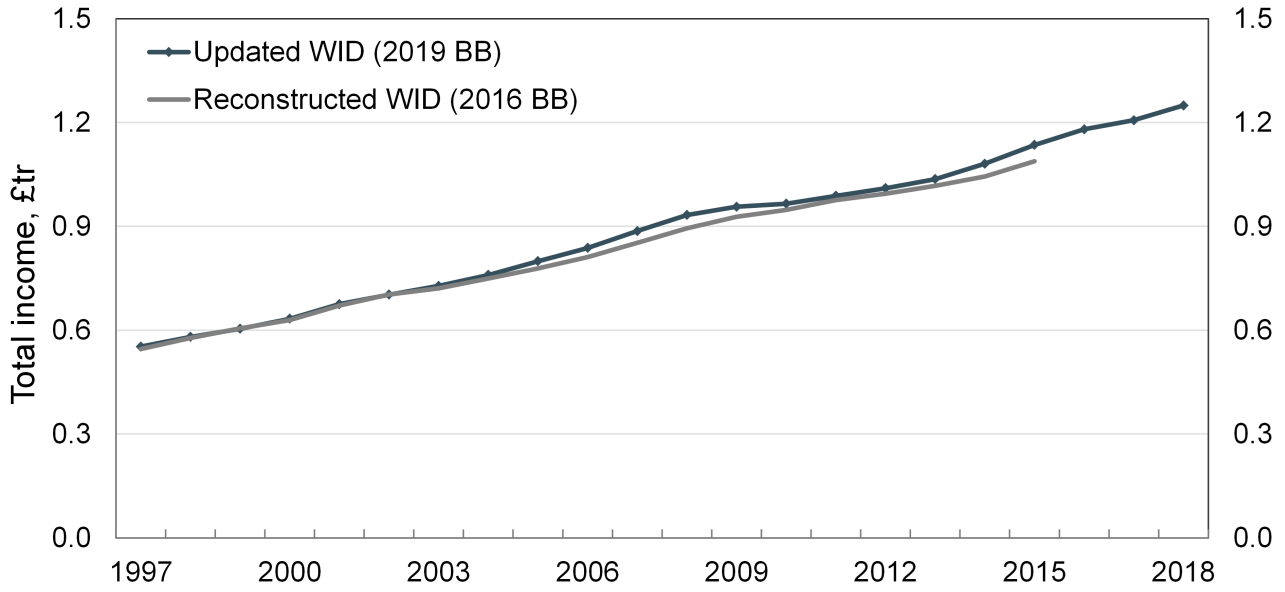
The net effect of these differences is that our NA-based income control total is considerably higher than the WID total (Figure 1). In the subsequent sections, we illustrate how one obtains our NA-based fiscal income total from the previous WID series step-by-step.

## C.1 Step 1: Update WID using up-to-date Blue Book

Using the previous WID methodology, we update the denominator series using the revised 2019 Blue Book estimates, maintaining the same definitions and procedures as outlined in the latest WID formula above. The revised income total is higher in each tax year since 2010-2014, ranging from 0% higher than the WID total in 2001-02, to 4.3% higher in 2013-14 (Figure C3). Revisions to the National Accounts are common, and the ONS note that "expectations

of accuracy and reliability in early estimates are often too high" (Office for National Statistics, 2019). The WID methodology does not update previous years' figures based on revisions to the Blue Book, resulting in an over-reliance on early estimates. The most substantial contribution to the change in recent years (particularly 2013-15) is an increase in the balance of gross primary income estimates. To the extent that the revised Blue Book estimates are of higher quality than earlier estimates, we should be updating the income control total to reflect these revisions.

Figure C3: **Reconstructed WID (2016 Blue Book) and updated WID (2019 Blue Book)**




**Notes:** 'Reconstructed WID (NA)' is constructed using the most recent WID formula (Alvaredo, 2017) with data from the 'Households and NPISH' sector of the 2016 Blue Book. Note that the income totals differ from the actual WID statistics for 2010-2014 as we use the 2016 Blue Book to obtain figures for all previous years, rather than using the earliest Blue Book available for a given year. 'Updated WID' is constructed using the most recent WID formula with data from the 'Household and NPISH' sector of the latest release of the Blue Book (2019).
**Source:** Authors' calculations based on the UK National Accounts.

## C.2 Step 2: Exclude the NPISH sector

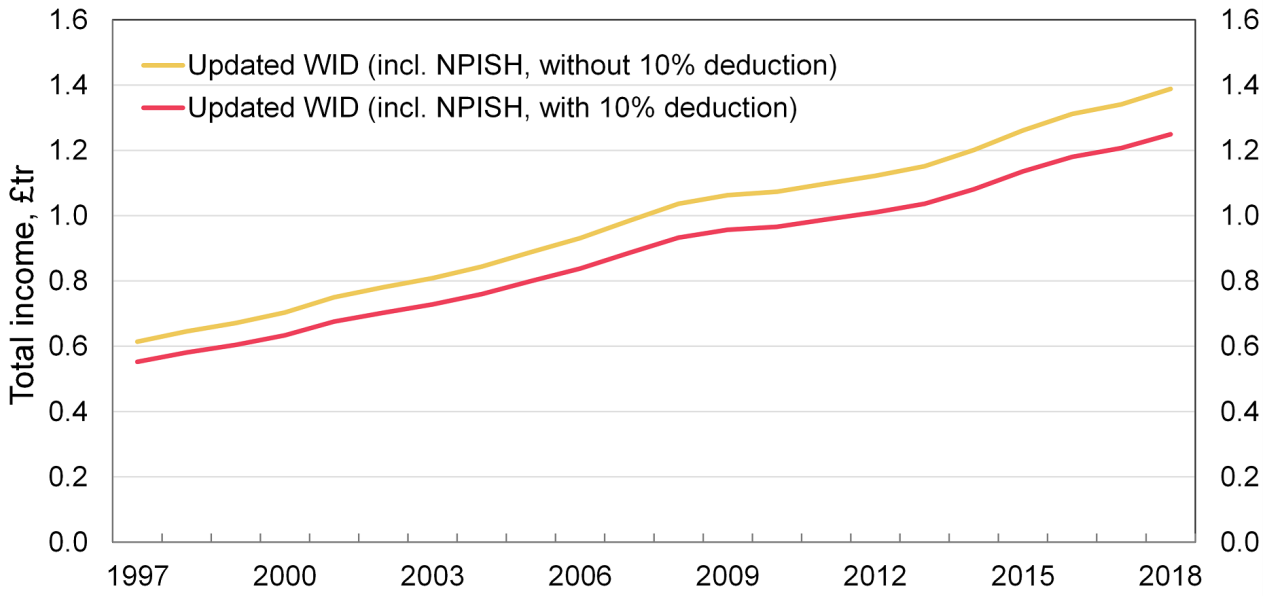
Until recently, the Blue Book did not disaggregate the household sector from the NPISH sector. The latter includes trade unions, universities and further education institutions, religious organisations, charitable organisations, and political parties. Using disaggregated National Accounts (made available since 2017), we update the WID series including only the household sector from the outset. In doing so, it is no longer appropriate to apply a 10% deduction to the income total obtained using the WID formula. The initial motivation for doing this was to offset the increase in the income total resulting from the adoption of ESA2010, on the basis that this upward revision was partly a reflection of an increase in income attributed to the NPISH sector (Atkinson and Ooms, 2015). If the NPISH sector can be excluded from the outset, then there is no argument for reducing the income total in this way.

We illustrate this change in two steps.

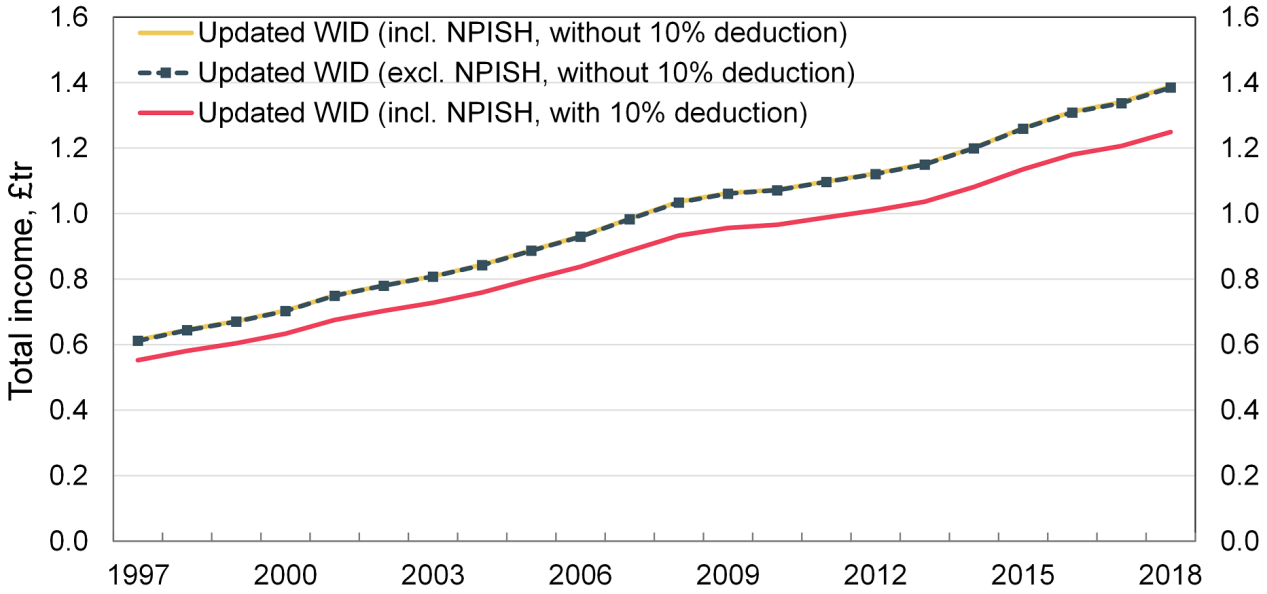
Figure C4a illustrates the income total including the NPISH sector with and without the 10% deduction (otherwise following the most recent formula used by WID). Figure C4b introduces the total computed by excluding the NPISH sector, without the 10% deduction. Excluding the NPISH sector and removing the 10% deduction increases the income total relative to the updated WID series (which includes and reducing the total by 10%). In fact, the revised income total is higher by just under 11% between 1997 and 2017 on average. The fact that the income total excluding the NPISH sector exceeds the income total using the combined sector approach implies that the 10% deduction applied previously was too great: upward revisions to the combined income of the household and NPISH sectors cannot be attributed to the NPISH sector alone. It is possible that a substantial proportion of the increase observed by WID following the implementation of ESA2010 can be attributed to inclusion of 'investment income payable on pension entitlements' in the newly updated formula. This component, Atkinson and Ooms (2015) argue, should be included the income total, as it "has a counterpart in household income". This added an additional £70 billion to the income total, increasing the total by approximately 7%.

Figure C4

(a) **Updated WID, before and after 10% deduction**




(b) **Updated WID, excluding NPISH and reversing 10% deduction**

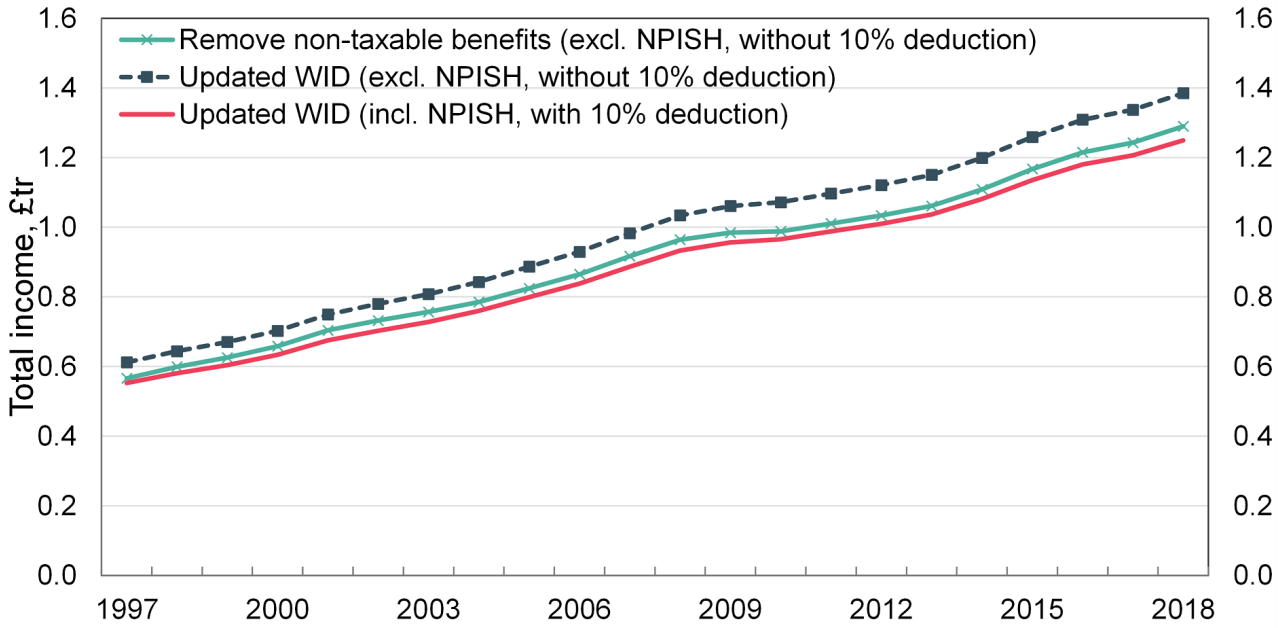



**Notes:** 'Updated WID (incl. NPISH, with 10% deduction)' is constructed using the most recent WID formula (Alvaredo, 2017) with data from the 'Household and NPISH' sector of the latest release of the Blue Book (2019). 'Updated WID (incl. NPISH, without 10% deduction)' is constructed by removing the 10% deduction from the most recent WID formula, using data from the 'Households and NPISH' sector of the 2019 Blue Book. 'Updated WID (excl. NPISH, without 10% deduction)' is constructed using by removing the 10% deduction from the most recent WID formula, and using data from the 'Households' sector of the 2019 Blue Book only.
**Source:** Authors' calculations based on the UK National Accounts.

## C.3 Step 3: Remove non-taxable benefits

The WID methodology does not correspond to a strict definition of fiscal income in that some non-taxable benefits are included in the total. In order to move closer to a fiscal income series, we remove these non-taxable benefits from the income total. Doing so reduces the income total relative to our updated WID series (excluding NPISH, without 10% deduction) by 7% on average between 1997 and 2017 (Figure C5).

Figure C5: **Updated WID, removing non-taxable benefits**

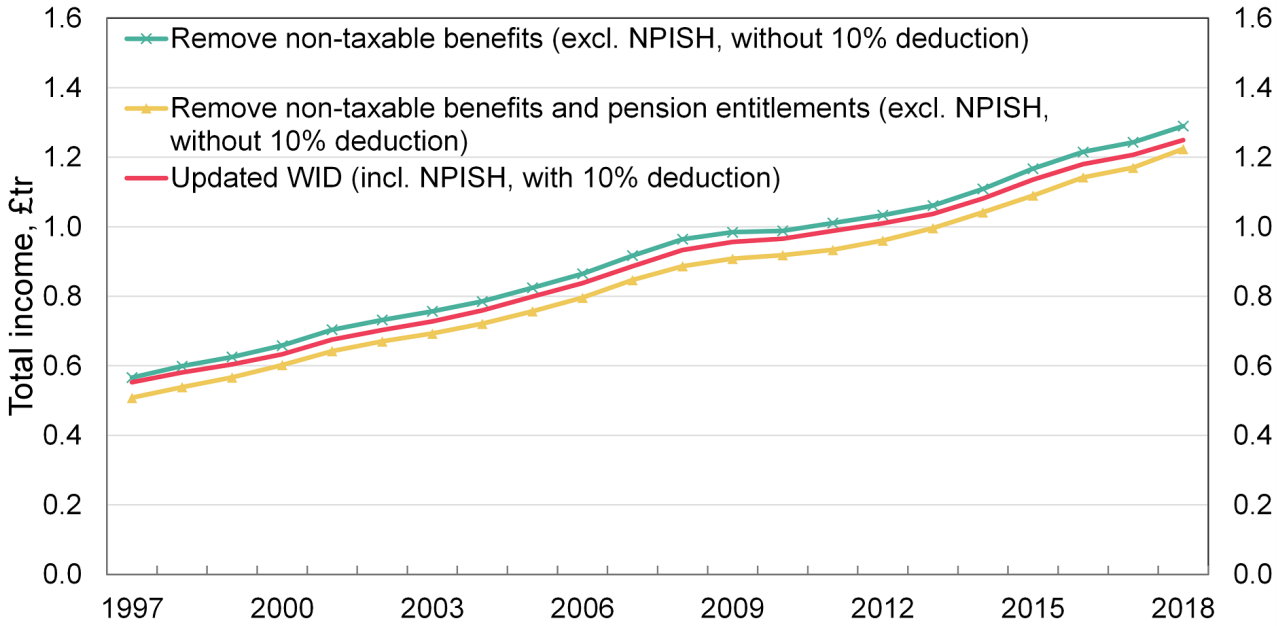



**Notes:** 'Updated WID (incl. NPISH, with 10% deduction)' is constructed using the most recent WID formula (Alvaredo, 2017) with data from the 'Household and NPISH' sector of the latest release of the Blue Book (2019). 'Updated WID (excl. NPISH, without 10% deduction)' is constructed using by removing the 10% deduction from the most recent WID formula, and using data from the 'Households' sector of the 2019 Blue Book only. 'Remove non-taxable benefits (excl. NPISH, without 10% deduction)' is constructed by removing non-taxable benefits (see Table A2 for full list) from the series 'Updated WID (excl. NPISH, without 10% deduction)' .
**Source:** Authors' calculations based on the UK National Accounts.

## C.4 Step 4: Deduct pension fund income, modify the interest concept, and reintroduce interest payments

We reverse the decision to include 'investment income payable on pension entitlements' in the income total, which is paid to pension funds, rather than directly to households. This has no counterpart in fiscal income. Deducting this component reduces our previous total, but by a rate which is decreasing over time, ranging from a 10% reduction in all years prior to 1998 to a 5% reduction in 2017-18 (Figure C6).

Figure C6: **Updated WID, removing non-taxable benefits and pension entitlements**



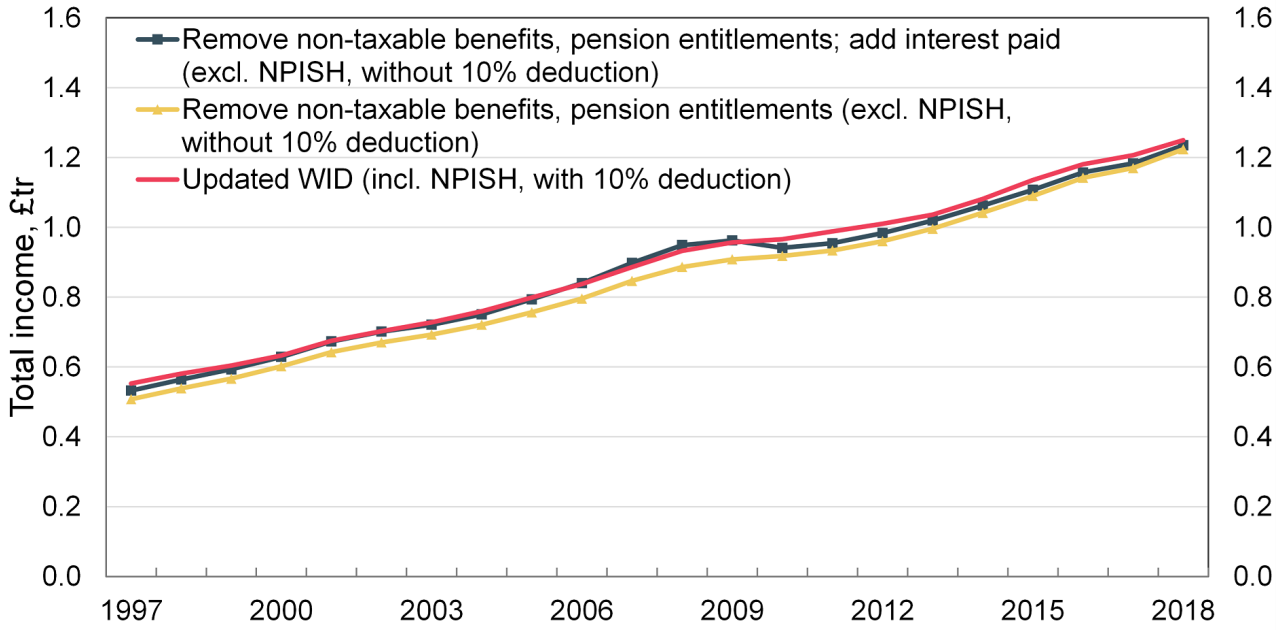

**Notes:** 'Updated WID (incl. NPISH, with 10% deduction)' is constructed using the most recent WID formula (Alvaredo, 2017) with data from the 'Household and NPISH' sector of the latest release of the Blue Book (2019). 'Remove non-taxable benefits (excl. NPISH, without 10% deduction)' is constructed by removing non-taxable benefits (see Table A2 for full list) from the series 'Updated WID (excl. NPISH, without 10% deduction)' (Figure C5). 'Remove non-taxable benefits and pension entitlements (excl. NPISH, without 10% deduction)' is constructed by deducting income attributable to pension entitlements from the series 'Remove non-taxable benefits (excl. NPISH, without 10% deduction)'.
**Source:** Authors' calculations based on the UK National Accounts.

There are two changes which we make to better align the interest total included in the WID definition with the fiscal income concept of interest. The first concerns the conceptual difference between interest as paid by financial institutions (and counted as fiscal income), and the National Accounts concept of interest. In the National Accounts, interest is decomposed into the actual interest paid on loans and deposits, and an implicit 'service charge', known as FISIM, paid by depositors and borrowers to financial institutions for their services as an intermediary. The National Accounts 'interest' received by households who hold deposits in bank accounts is the estimated (fictional) interest that households would receive before the implicit charge for financial services is deducted. Thus, what is termed 'interest' in the National Accounts is the sum of bank interest ('interest before FISIM allocation') and FISIM. Only the first component has a counterpart in fiscal income, yet the WID fiscal income series uses the National Accounts concept of interest (which is higher).

The National Accounts concept of interest is not explicitly added in the WID definition, but is included implicitly as part of the balance of gross primary income component. Therein lies another conceptual difference which departs from the fiscal income concept of interest: the balance of gross primary income includes *net* interest, i.e. interest received by households minus interest paid on loans (including mortgages). As no tax deduction is made for interest

payments, we do not want to deduct these from total income.[4] Amending the concept of interest included in the NA-based income total results in the first significant change in the trend of the National Accounts-based total (Figure C7), driven by the switch from net interest to all interest received by households. Interest receipts (and payments) rose significantly in the lead up to the financial crisis, and fell afterwards. The result is a National Accounts-based income total whose trend corresponds more closely to the SPI-based income total series. This is a reassuring sign that we are approaching an income measure more closely aligned with the definition of fiscal income.

Figure C7: **Updated WID, removing non-taxable benefits and pension entitlements, adding interest paid**




**Notes:** 'Updated WID (incl. NPISH, with 10% deduction)' is constructed using the most recent WID formula (Alvaredo, 2017) with data from the 'Household and NPISH' sector of the latest release of the Blue Book (2019). 'Remove non-taxable benefits and pension entitlements (excl. NPISH, without 10% deduction)' is constructed by deducting income attributable to pension entitlements from the series 'Remove non-taxable benefits (excl. NPISH, without 10% deduction)' (fig C6). 'Remove non-taxable benefits, pension entitlements; add interest paid (excl. NPISH, without 10% deduction)' is constructed by reversing the deduction of interest and rent on natural resources paid by households (i.e. adding these payments back in) to the series 'Remove non-taxable benefits and pension entitlements (excl. NPISH, without 10% deduction)'. In addition, the concept of interest received by households is changed from the National Accounts concept (including FISIM) to the fiscal income concept (excluding FISIM).
**Source:** Authors' calculations based on the UK National Accounts.

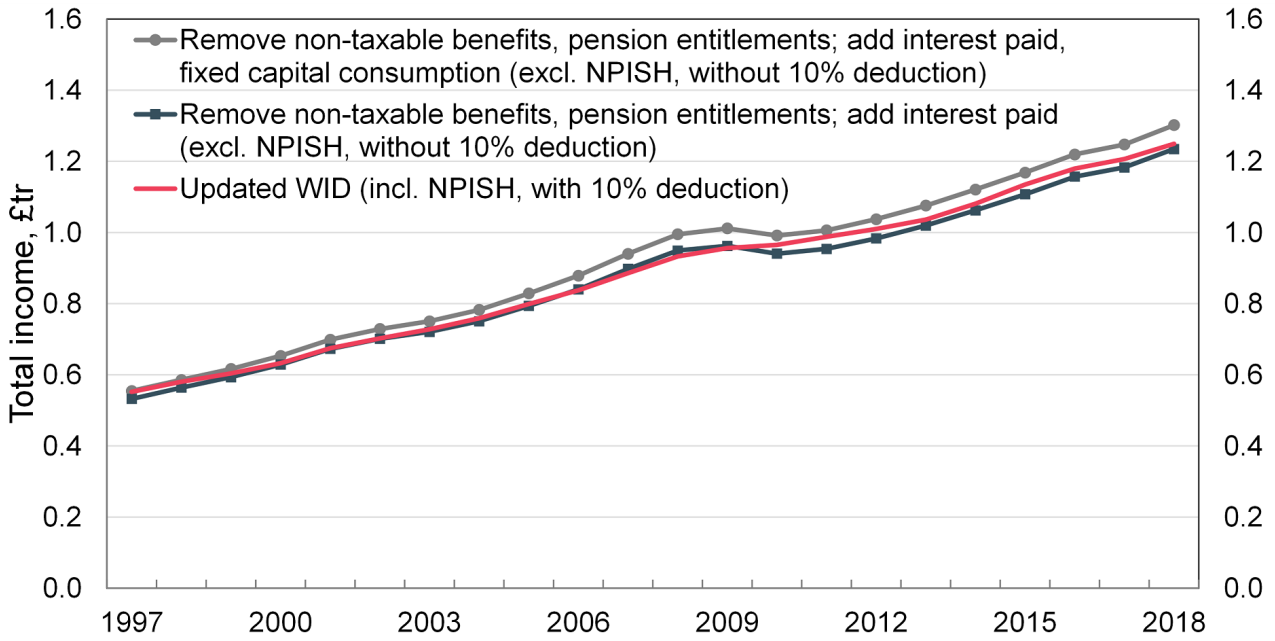
## C.5 Step 5: Addressing other conceptual differences (adding fixed capital consumption and excluding gross operating surplus)

National income as defined in the National Accounts represents the total income received after the deduction of fixed capital consumption. The WID formula adopts this convention, deducting the fixed capital consumption of the

[4]Rent paid on natural resources is also deducted from the WID income total in a similar way, though this component is very small in magnitude. We add this back in just as we add interest paid by households, but do not separately show its effect here.

household sector from the income total. No such deduction is taken into account in the calculation of fiscal income, and so we reverse the deduction of this component from the National Accounts total. Fixed capital consumption trends upwards over time, so reversing its deduction increases the slope of the National Accounts-based income total (Figure C8).

Figure C8: **Updated WID, removing non-taxable benefits and pension entitlements, adding interest paid and fixed capital consumption**



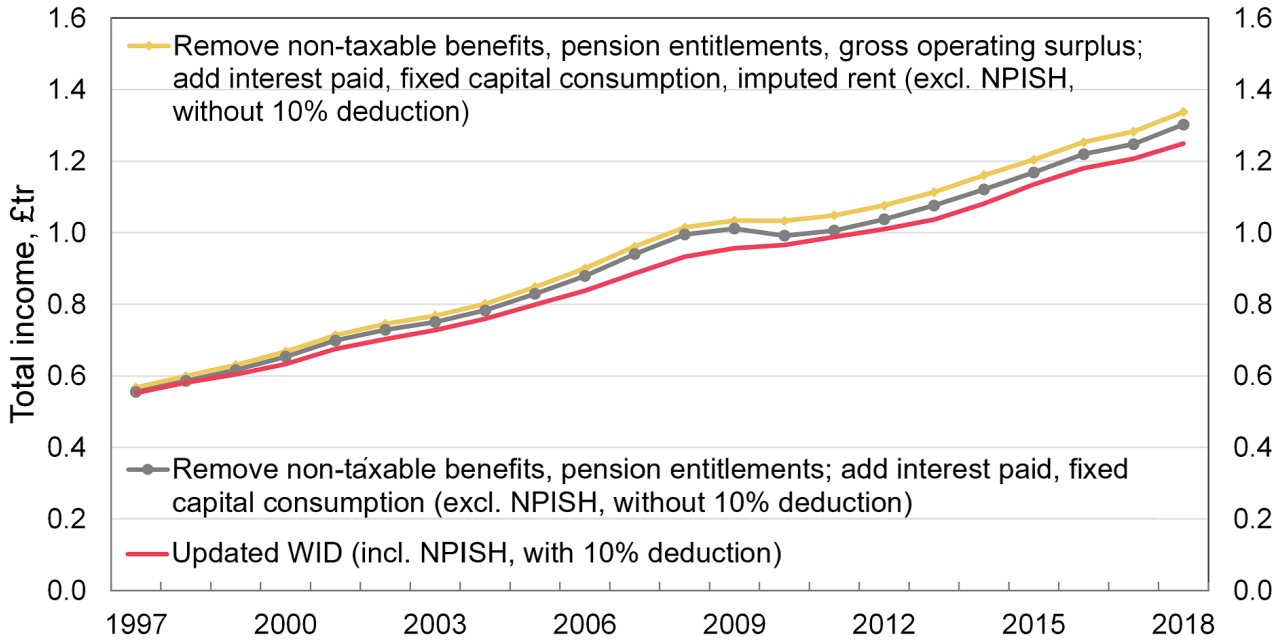

**Notes:** 'Updated WID (incl. NPISH, with 10% deduction)' is constructed using the most recent WID formula (Alvaredo, 2017) with data from the 'Household and NPISH' sector of the latest release of the Blue Book (2019). 'Remove non-taxable benefits, pension entitlements; add interest paid (excl. NPISH, without 10% deduction)' is constructed by reversing the deduction of interest and rent on natural resources paid by households (i.e. adding these payments back in) to the series 'Remove non-taxable benefits and pension entitlements (excl. NPISH, without 10% deduction)'. In addition, the concept of interest received by households is changed from the National Accounts concept (including FISIM) to the fiscal income concept (excluding FISIM) (as in fig C7). 'Remove non-taxable benefits, pension entitlements; add all property income changes, fixed capital consumption (excl. NPISH, without 10% deduction)' is constructed by reversing the deduction of fixed capital consumption from the series 'Remove non-taxable benefits, pension entitlements; add interest paid (excl. NPISH, without 10% deduction)'.
**Source:** Authors' calculations based on the UK National Accounts.

Finally, the WID income total includes the gross operating surplus of the household (and NPISH) sector, which is a subcomponent of the balance of gross primary income and includes the imputed rent of owner-occupiers, later deducting a total for imputed rentals (these have no counterpart in fiscal income). The issue with this approach is that while gross operating surplus includes the imputed rentals of owner occupiers, the imputed rent total which is then deducted is obtained from the final consumption expenditure table of the Household, NPISH and General Government sectors combined. This expenditure total exceeds the value of gross operating surplus accruing to households, meaning that the addition of (gross operating surplus - imputed rent) results in an economically meaningless net *deduction*

from total income. In Section C.6, we discuss alternative approaches to addressing this issue. For our main series, we exclude gross operating surplus from the outset (and remove the deduction for imputed rent). Removing the meaningless deduction arising from the inclusion of (gross operating surplus - imputed rent) increases the income total by 2.7% on average (Figure C9).

Figure C9 illustrates how our as-close-to-fiscal-as-possible National Accounts total (black line) compares to what the income total would look like using the latest WID methodology with the current Blue Book (dashed grey line). The trend in total income is flatter using the WID methodology, implying a steeper rise in income inequality than we observe using our alternative National Accounts income total.

Figure C9: **Updated WID, removing non-taxable benefits, pension entitlements and gross operating surplus, adding interest paid, fixed capital consumption, and imputed rent**




**Notes:** 'Updated WID (incl. NPISH, with 10% deduction)' is constructed using the most recent WID formula (Alvaredo, 2017) with data from the 'Household and NPISH' sector of the latest release of the Blue Book (2019). 'Remove non-taxable benefits, pension entitlements; add interest paid, fixed capital consumption (excl. NPISH, without 10% deduction)' is constructed by reversing the deduction of fixed capital consumption from the series 'Remove non-taxable benefits, pension entitlements; add interest paid (excl. NPISH, without 10% deduction)' (fig C8). 'Remove non-taxable benefits, pension entitlements, gross operating surplus; add interest paid, fixed capital consumption, imputed rent (excl. NPISH, without 10%deduction)' is constructed by removing gross operating surplus and reversing the deduction for imputed rent from the series 'Remove non-taxable benefits, pension entitlements; add interest paid, fixed capital consumption (excl. NPISH, without 10% deduction)', resulting in our final NA-based income control series which is equivalent to 'NA-based pre-tax total' in Figure 1.
**Source:** Authors' calculations based on the UK National Accounts.

## C.6 Alternative approaches to including rental income in the NA-based income total

The WID total includes gross operating surplus accrued by the household (and NPISH) sector, and deducts a total for imputed rent which does not correspond to the imputed rent of owner-occupiers included in gross operating surplus.

In our main NA-based income series, we exclude gross operating surplus from the outset. However, there may be a case for including some (small) fraction of gross operating surplus. Whether or not this desirable depends on what else is included in this component. Some sources suggest that gross operating surplus is made up of both the imputed rentals of owner-occupiers, as well as rental income from the leasing of dwellings (see data tables accompanying ONS (2015)), while others suggest that gross operating surplus includes imputed rentals only, with actual rentals included in mixed income (ONS, 2019)[5]. Ideally, if gross operating surplus were to include actual rental income, this would be included in our fiscal income total. However, the National Accounts do not disaggregate gross operating surplus, meaning that we cannot directly add its subcomponents. We consider two approaches to this issue:

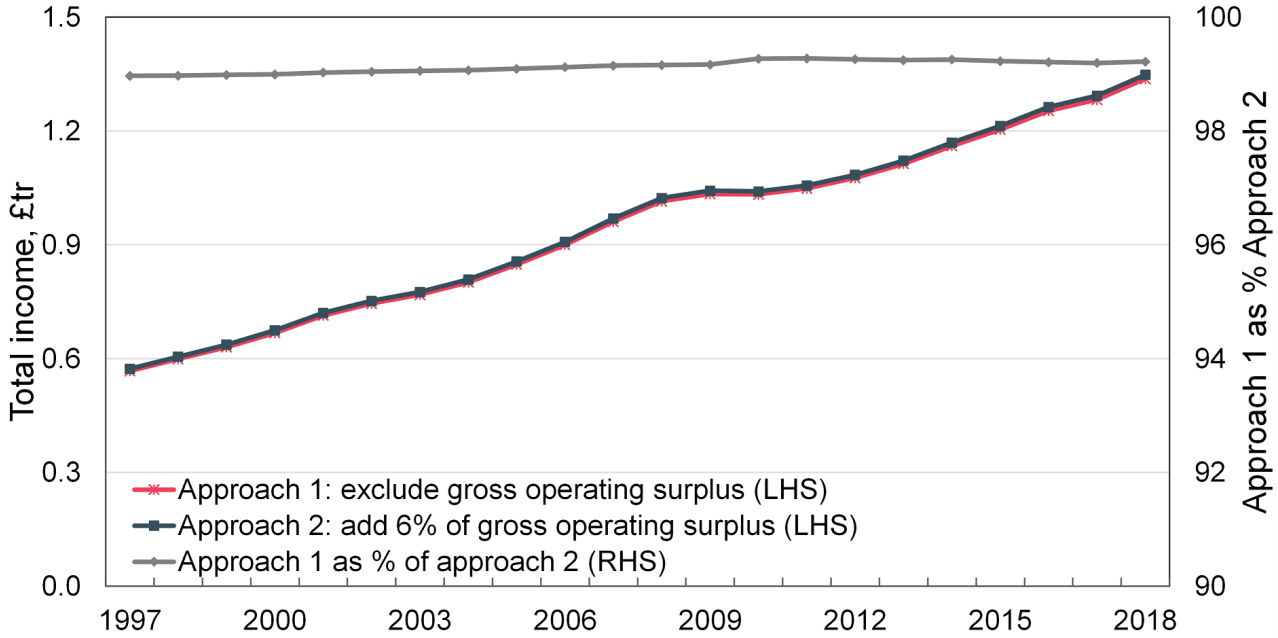
1. Exclude gross operating surplus from the outset (and make no deduction for imputed rent) - our preferred approach

2. Add a constant fraction of gross operating surplus to total income, informed by the breakdown of Gross Operating Surplus provided in the data tables accompanying ONS (2015) for the years 2008, 2012 and 2013.

The first approach would make sense if gross operating surplus included the imputed rent of owner-occupiers only. On the other hand, were actual rental income to be included in gross operating surplus, then including a constant fraction of gross operating surplus to approximate actual rental income may be preferable. The desirability of the second approach will also depend on whether estimated property incomes obtained by taking a constant fraction of gross operating surplus look similar in levels and trends to property income estimates derived from other data sources (including the SPI). If estimated property incomes using the constant fraction approach follow very different trends from direct estimates of property income, then this approach could result in a significant amount of noise, and following approach (1) may be the safer option. ONS (2015) provide a breakdown of gross operating surplus into 'owner occupied dwellings' and 'leasing of dwellings' for the years 2008, 2012 and 2013 (based on the 2015 Blue Book). The proportion of gross operating surplus accounted for by 'leasing of dwellings' in each year is 5.7%, 5.7% and 6.4% respectively. As an approximation to income from the rental of property, we take 6% of the gross operating surplus in each year, and add this to the income total (Approach 2). Figure C10 shows that the choice of approach is relatively unimportant; adding 6% of gross operating surplus increases total income by £11 billion at most.

[5]See also `https://www.ons.gov.uk/economy/nationalaccounts/supplyandusetables/adhocs/008872grossoperatingsurplusearnedfromrentalintheukandtheamountattributabletoowneroccupiersonabluebook2018basis`

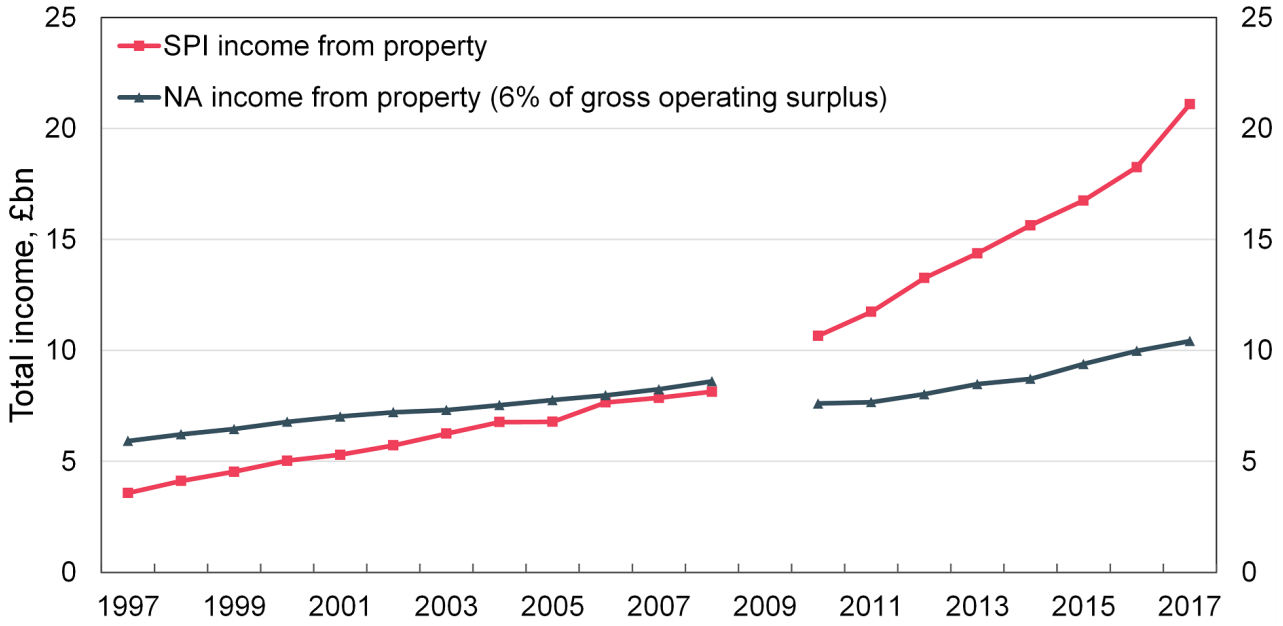
Figure C10: **NA-based fiscal income total using alternative approaches to rental income**




**Notes:** 'Approach 1' is constructed using our preferred NA-based income control formula (Section 4.2) using data from the 2019 Blue Book. 'Approach 2' is constructed by adding 6% of the value of 'gross operating surplus' to our preferred NA-based income control total.
**Source:** Authors' calculations based on the UK National Accounts

Our main NA-based series uses the first approach. In part, this is is because evidence suggests that taking a constant fraction of gross operating surplus may at best give a very noisy approximation to income from the rental of property. Figure C11 plots property income derived from the SPI alongside our NA-based approximation. The two series produce similar totals in the mid 2000s, but follow very different trends. Our NA-based approximation appears to miss a growing proportion of property income relative to the SPI total in recent years. The issue of properly accounting for property income exemplifies the difficulties in constructing an income total from the National Accounts which corresponds closely to fiscal income.

Figure C11: **Income from property based on (i) the SPI and (ii) our NA approximation**




**Notes:** 'SPI income from property' plots the total value of income from property assessable for Income Tax, based on data from the SPI Public Use Tape (using the variable 'INCPROP'). 'NA income from property (6% of gross operating surplus)' is based on the value of gross operating surplus obtained from the 'Households' sector of the 2019 Blue Book.
**Source:** Authors' calculations based on the UK National Accounts and SPI Public Use Tapes.